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Input Indicators of the British Columbia High Technology Sector

2001 Edition

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A joint project of BC STATS and the
BC Ministry of Competition, Science & Enterprise

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EXECUTIVE SUMMARY

This is the second annual report prepared by BC STATS in conjunction with the Science, Technology and Telecommunications Division to assess conditions that affect the growth of the high technology sector in British Columbia. This report tracks thirty-two business and economic climate indicators for the province, and provides comparisons to other provinces for twenty-eight of them. The indicators cover key aspects of the educational, business, government, external, and labour sectors from the point of view of their impact on high technology firms.

The indicators, which might be termed "input" measures, are chosen for their relevance and general acceptance, as well as their availability on an ongoing basis. Only indicators for which updated information has been obtained are included in this edition.

Indicators of the success, or "outputs" of the high technology sector, are covered by a companion report, the *Profile of the British Columbia High Technology Sector*.[1] The *Profile* contains information on high technology GDP, employment, wages and salaries, revenues, establishments, and exports and imports.

The picture of British Columbia that emerges from the input indicators is varied. In some areas, British Columbia is strong when compared to other provinces, and has shown strong growth over the past decade. In other areas, performance has lagged. In this way, the detailed indicators offer concrete guidance about potential government policies and industry growth strategies.

A convenient feature of this publication is the simple description of the trends in each indicator as up, down, or stable (indicated in summary tables as ↑, ↓, or →). Since last year, the trend in seven indicators has been re-evaluated, based on the latest information. Upward trends in annual BSc graduates in engineering and in computer science have been revised to stable and downward, respectively. Similarly, the upward trend in the education levels of immigrants appears to have leveled. On the more positive side, the decline in government performance of R&D now appears stabilized (however, gross expenditure on R&D in the province is now declining as a share of GDP). Finally, patents per capita are now rising, although they remain well below the levels in Ontario and Quebec.

Summary results for each sector are presented in the body of the report. More detailed information is contained in the tables in Appendix II.

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[1] Available at http://www.bcstats.gov.bc.ca/DATA/BUS_STAT/hi_tech.htm

In the **educational sector**, British Columbia had strong educational attainment in the general population throughout the 1990s. The data for the last reporting year shows BC continuing to have the highest percentage of the population with high school education. However, BC shows a very significant deficiency with respect to the training of new graduates in engineering and computer science. Similarly, higher education research and development is significantly low by Canadian standards, in relation to GDP.

In the **business sector,** compared to other Canadian provinces, British Columbia returns average or below average ratings in all of the stimulus indicators. However, many have long term upward trends and have shown good performance in the last two years. Exceptions are venture capital and business sector research and development. The proportional share of Canadian venture capital investment attracted by BC business has declined from the previous year. Business sector performance of research and development has also lagged, and as in last year's report, the ratio of research and development performance by business to provincial GDP was over twice as large in Quebec and Ontario as in BC.

In the **government sector**, taxation of individuals and small business is more favourable in BC than in most other provinces, while the general corporate tax rate is higher than the Canadian average. Overall, the level of business taxation in BC declined through the 1990s with the exception of the corporate tax rate, which remained constant from 1993 to 2000. Combined federal and provincial government performance of R&D is substantially lower in BC than in other provinces, as a share of GDP. In 1998 (the latest data year), the share was 30% lower than in the next closest province – Alberta.

In the **external sector**, the number of well-trained immigrants to Canada has increased greatly in recent years, and their level of schooling has increased as well. In relation to its population size, British Columbia is on a par with other provinces in attracting skilled foreigners. BC is likely to gain educated and trained workers when there is in-migration from other provinces. However, since 1998, BC has been experiencing inter-provincial out-migration. BC imports of high technology goods—which can be an indicator of future production—dropped in 1996, but have steadily increased in the past few years.

For **labour**, unemployment rates among workers in the natural and applied sciences are well under half of the rates in the economy overall. Further, these unemployment rates have been falling quite consistently since the early 1990s. In terms of researchers per 100,000 persons, British Columbia moved from an eighth place ranking in 1995 to a fourth place ranking in 1998. While the number of researchers in BC increased only slightly in 1998, several other provinces' total number of researchers decreased, placing BC in the higher rank.

TABLE 1: Quick Summary of Indicators

INDICATORS	Trend	Latest year	Relative to other provinces	Page
EDUCATION SECTOR				
E-1: High school diplomas per capita	↑	↑	above average	6
E-2: Post-secondary credentials per capita	↑	↑	average	7
E-3: 16 year-old achievement rank: science	↓	↓	below average	8
E-4: Annual BSc graduates in engineering per 100,000	→	↑	below average	9
E-5: Annual BSc graduates in computer science per 100,000	↓	↓	below average	10
E-6: Percentage of households with computers	↑	↑	above average	11
E-7: Percentage of households using the Internet	↑	↑	above average	12
E-8: Percentage of small businesses using the Internet	n/a	n/a	above average	13
E-9: Gross income per technology license at universities	→	↑	below average	14
E-10: US patents issued to top two universities	↑	↑	above average	15
E-11: Higher education performance of R&D to GDP ratio	→	↓	below average	16
BUSINESS SECTOR				
B-1: Patents per capita	↑	↑	below average	19
B-2: Patent applications per capita	↑	↑	below average	19
B-3: Entries and exits into the high technology sector	↑	↑	n/a	20
B-4: # of establishments in the high technology sector	↑	↑	n/a	20
B-5: # of gazelles (high growth companies)	↑	↑	n/a	21
B-6: Venture capital	↑	↑	average	22
B-7: Venture capital: share of Canadian total	→	↓	average	23
B-8: Venture capital per capita	↑	↑	below average	23
B-9: Business performance of R&D to GDP ratio	→	↓	below average	24
GOVERNMENT SECTOR				
G-1: Tax index for $80,000 income	↓	↓	below average	26
G-2: Small business tax rate	↓	↓	below average	27
G-3: Corporate tax rate	→	→	above average	27
G-4: Government performance of R&D to GDP ratio	→	↓	below average	28
G-5: Gross expenditure on R&D (GERD) to GDP ratio	↓	↓	below average	29
EXTERNAL SECTOR				
X-1: Number of immigrants with higher education	↑	↑	average	33
X-2: Education level of immigrants	→	→	average	33
X-3: Net inter-provincial migration	↓	↑	below average	34
X-4: High technology imports	↑	↑	n/a	35
LABOUR				
L-1: Unemployment rate for natural and applied sciences	↓	↓	below average	38
L-2: Ratio of unemployment rate for natural and applied sciences to the unemployment rate for all occupations	↓	↓	below average	39
L-3: Research personnel per capita	↓	↓	below average	40

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INTRODUCTION

Although industry has been knowledge- and technology-based through history, information as a driver of economic growth has grown dramatically in importance in the last quarter-century. Economies are now much more dependent on the production, dissemination, and use of knowledge. In turn, output and employment are expanding most rapidly in high technology industries, which are those industries whose primary input is knowledge.

The first edition of this report, *British Columbia High Technology Input Indicators: The 1990s*, was released in 2000. This annual series of reports will monitor the high technology sector from the input side, by measuring and analyzing the production and application of knowledge, and the climate, institutions, and funding arrangements that make this knowledge available for development of the BC high technology sector. This report is to be used hand-in-hand with the output report, the *Profile of the British Columbia High Technology Sector*,[2] to give an overall indication of where BC's high technology sector has been and where it might be heading.

Background

Since 1994, BC STATS has been producing the *Profile of the British Columbia High Technology Sector* annually. The *Profile* gives measures of GDP, employment, wages and salaries, revenues, establishments, and exports and imports – what might be called the outputs of the high technology sector. By maintaining a consistent methodology from year to year, the *Profile* gives an excellent indication of the growth of the BC high technology industry.

While there is obvious value in monitoring the "output" of the high technology sector, informed policy-making requires information about the processes that give rise to that output. In fact, the high technology sector and the surrounding infrastructure are a complex system with many players and interactions. Understanding this system is a matter of identifying the various parts, and collecting information that shows how these parts behave and interact over time.

Information on the high technology "system" will help to show the best ways to foster growth in the sector. This will almost certainly include assistance to parts of the system that are only indirectly linked to actual production (and often removed in time). For example, improvements to the secondary school system may seem different in kind from output subsidies or tax cuts for high technology firms, but both schools and firms may be components of the same system.

[2]Available at http://www.bcstats.gov.bc.ca/DATA/BUS_STAT/hi_tech.htm

Good information will help to confirm such suppositions, and most importantly, to identify the strength of any anticipated relationships (see APPENDIX I).

Comparison with Other Jurisdictions

Wherever possible, the indicators selected for this publication have been presented for the provinces of Alberta, Ontario, and Quebec. Comparisons to other provinces show the range of what is possible, or what has been achieved, within the Canadian context. These three provinces have the largest general economies, and they are the ones with the most extensive high technology sectors. Based on 2000 data, the share of high tech employment for these provinces range from 4.6% to 5.1% of total employment. The BC share for the same year was 3.9%. In the remaining provinces and territories, the high tech share was 2.4%. The overall average share of high tech employment in Canada was 4.4%.

It should be noted that the provinces used for comparative purposes do have significant variation in terms of high technology growth. For the ten years leading to 2000, Ontario posted high tech employment growth of just 3.0%, while Quebec posted 4.0%, and Alberta and BC posted 8.4%. Growth in the rest of Canada was 3.6%.

Another advantage of the comparisons to other provinces is that the basis for tabulating the statistics is consistent. Comparisons between jurisdictions with varying definitions, methods of collection, laws, and economic infrastructure are often of little or no use. That is why international comparisons, such as comparisons to US states, have not been included in this edition. Very careful study is needed before such comparisons can be used with confidence. Nevertheless, some international comparisons are a goal for future editions.

Many of the indicators used in *The British Columbia High Technology Sector Input Indicators Report: The 1990s* were based on data from the 1996 Census. As this data is only updated every five years, the indicators based on that data are not included in this edition. Over the next two years, data from the 2001 Census will become available and be used to determine indicators for future reports.

The "Quick Summary" Tables

The thirty-two indicators selected for this publication represent only a fraction of the information base that is available about the high technology sector. However, even this number of indicators measured over time and across provinces poses a challenge to readers looking for an overview of the current situation and an indication of which areas warrant further study. To meet this challenge, this report is first divided according to the four "sectors" outlined in the model diagram (see APPENDIX I). One of the "inputs," labour, is also covered in a separate section. Each of the five resulting sections covers a number of individual indicators. These indicators are listed on the first page of each section, providing a quick summary. The summary makes use of up, down, and horizontal arrows (↑,↓,→) to show whether the indicator has risen, dropped, or remained substantially unchanged. The assessment is made with regard to the trend over the span of time for which the indicator is available, and for the latest period. British Columbia is also compared to the Canadian average for each indicator. British Columbia is characterized as being above, below, or substantially equal to this average.

Since the arrow indicators show only the direction of change, the summary report gives no indication of the size of changes, or their pattern over time. This information is found in the graphs and text included in each section. Data tables for each indicator are located in APPENDIX II.

It is immediately apparent that some indicators will be up while others are down, and that these movements are of differing intensity. Forming an overall assessment of the state of the high technology sector involves the evaluation of the significance of each indicator (weighting each indicator) and combining this with the strength of recent movements, trends, and comparisons to other provinces. This reports provides tools and information that can help with this assessment, but no attempt is made to combine the indicators into a single measure.

EDUCATIONAL INDICATORS

The educational sector provides "inputs" to high technology firms in two ways:

1. when individuals acquire skills and knowledge required for product development and production
2. during the commercialization of research performed in the educational sector.

The indicators listed below are measures of this dual role. Many are presented on a per capita or per gross domestic product (GDP) basis to allow meaningful comparison with other provinces.

Throughout the 1990s, British Columbia had strong educational attainment in the general population.[3] The data for the last reporting year shows BC continuing to have the highest percentage of the population with high school education. However, BC shows a very significant deficiency with respect to the training of new graduates in engineering and computer science. For example, the BC proportion of engineering graduates relative to population is less than half of the proportion of graduates in Ontario and Alberta. Similarly, the BC ratio of higher education R&D to GDP is low when compared to Canadian standards.

TABLE 2: Quick summary of indicators for the education sector.

INDICATORS	Trend	Latest year	Relative to other provinces
E-1: High school diplomas per capita	↑	↑	above average
E-2: Post-secondary credentials per capita	↑	↑	average
E-3: 16 year-old achievement rank: science	↓	↓	below average
E-4: Annual BSc graduates in engineering per capita	→	↑	below average
E-5: Annual BSc graduates in computer science per capita	↓	↓	below average
E-6: Percentage of households with computers	↑	↑	above average
E-7: Percentage of households using the Internet	↑	↑	above average
E-8: Percentage of businesses using the Internet	n/a	n/a	above average
E-9: Gross income per technology license at universities	→	↑	below average
E-10: US patents issued to top two universities	↑	↑	above average
E-11: Higher education performance of R&D to GDP ratio	→	↓	below average

[3] *The BC High Technology Sector Input Indicators Report – the 1990s.* 2002. BC Stats and the BC Information, Science and Technology Agency.

Educational Attainment

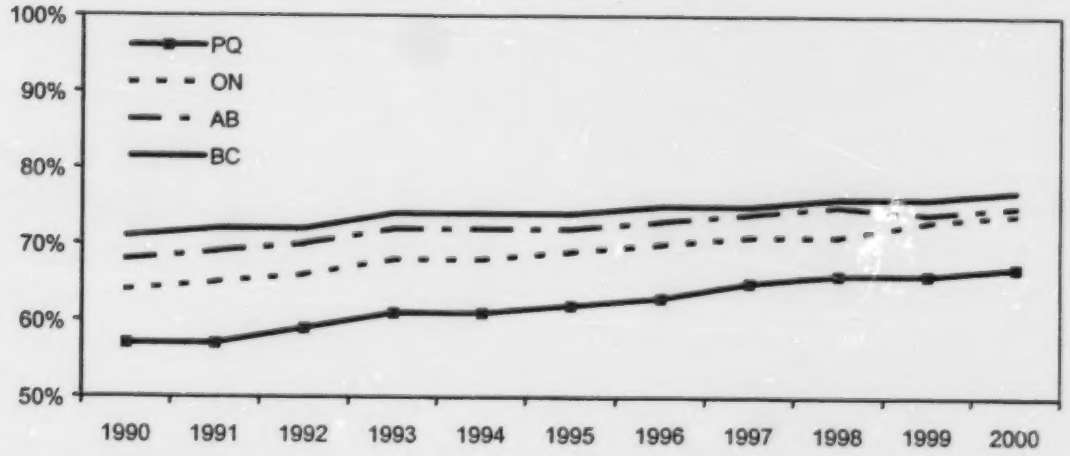
Two indicators of educational attainment – the percentage of the population aged 15 and older with a high school diploma and the percentage with post-secondary credentials – both showed steady increase across Canada throughout the 1990s. This trend continued in the last reporting year. More people are completing high school and continuing their education to obtain post-secondary credentials.

Why are these indicators important?

These indicators are considered important to the development of the high technology sector because higher levels of educational attainment suggest a more knowledgeable population base that is better able to understand and participate in the complexity of the high technology economy. Also, higher levels of educational attainment enable high technology firms to draw from a broader, more highly developed skill base.

BC leads the high technology provinces with the highest percentage of its population with a high school diploma. However, the gap between BC and the other high technology provinces has narrowed over the 1990s. In 1990, BC's percentage with a high school diploma was seven percentage points higher than Ontario, and three percentage points higher than Alberta. In 2000, this figure was three percentage points higher than Ontario and two percentage points higher than Alberta.

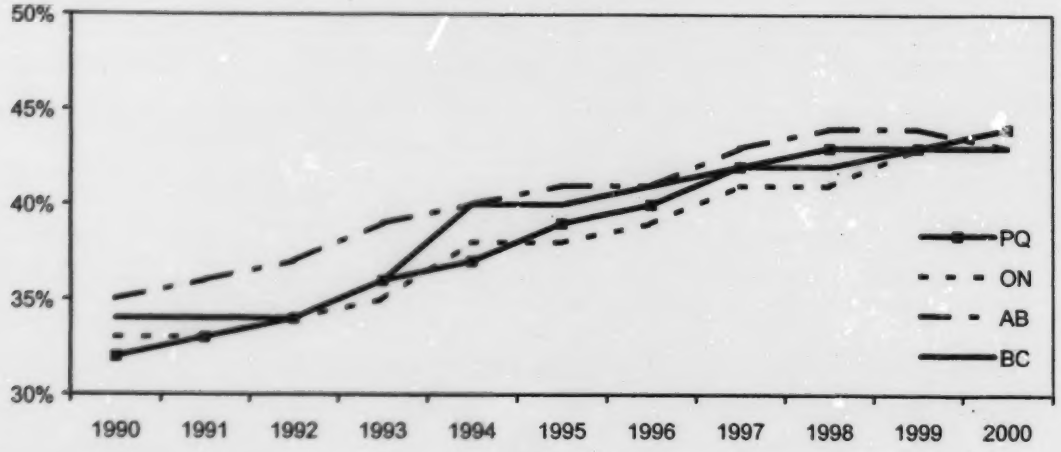
INDICATOR E-1: Percentage of the population 15 years and older with a high school diploma.



Source: Statistics Canada

Each of the high technology provinces has improved its post-secondary achievement over the past decade. The gap between the four high technology provinces in the percentage of the population with post-secondary credentials is quite small, and has narrowed in the period observed. Throughout the 1990s, Alberta had the highest percentage. However, in the last reporting year, Quebec led the high technology provinces by one percentage point.

INDICATOR E-2: Percentage of the population 15 years and older with post-secondary credentials.



Source: Statistics Canada

The measure of the population with post-secondary credentials includes persons who attended a public or private institution after high school and obtained a certificate, diplomas or degree. This measure also includes trade and vocational certificates, and apprenticeship programs. People who have enrolled and quit or who have not yet completed a program are not included.

Achievement on Canadian Standardized Tests

From the inception of the School Achievement Indicators Project, BC consistently ranked in the top six provinces in terms of the percentage of 16-year olds demonstrating excellence on Canada-wide standardized science tests. Alberta ranked consistently in the top two.

Why is this indicator important?

Standardized testing in science offers a comparable measure nation-wide for the demonstrated skills and knowledge of students of a given age. The School Achievement Indicators Project, founded in 1993, is a nation-wide project of the Council of Ministers of Education, Canada. Completed tests are graded into five levels of demonstrated competence. The rankings presented here are based on the percentage of students who achieved at level 4 and above (the upper end of achievement). This indicates the percentage with higher than average abilities in science.

In 1999, the second science assessment was administered; the first assessment took place in 1996. The purpose of the science written assessment is to assess students':

- knowledge of the concepts of science
- understanding of the relationship of science to technology and societal issues,
- conceptual knowledge,
- procedural knowledge, and
- ability to use science to solve problems.

In the 1996 and 1999 science achievement testing of 16-year-olds, Alberta ranked first nation-wide. BC slipped from a fifth place rank nation-wide in 1996 to sixth in 1999. Quebec improved in rank, while Ontario fell from sixth place in 1996 to tenth in 1999.

INDICATOR E-3: Canada-wide rank of 16 year-old achievement in science.

PROVINCE	1996 RANK	1999 RANK
Alberta	1	1
British Columbia	5	6‡
Ontario	6†	10
Quebec	8	4

† tied with Prince Edward Island
‡ tied with Nova Scotia

Engineering and Computer Science Degrees

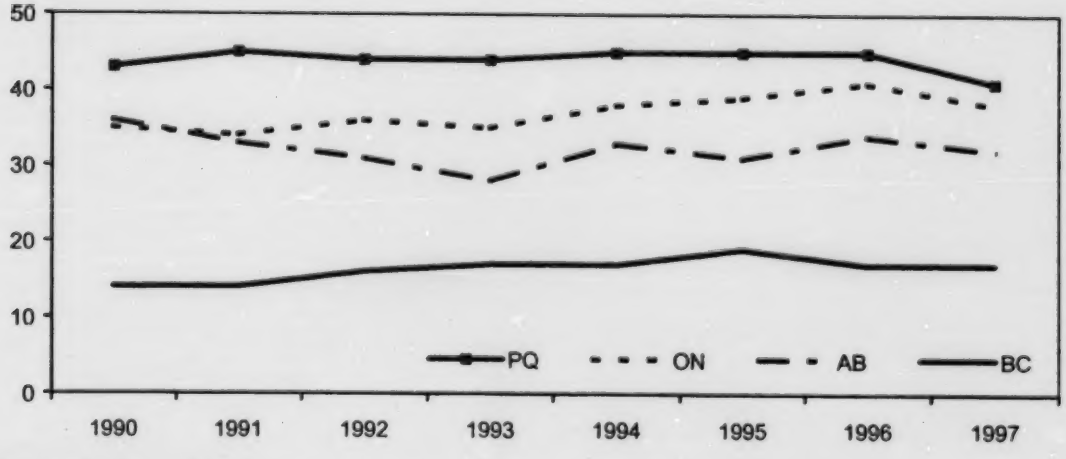
The presence of engineers and computer scientists in a high technology economy is indicated by number of graduates per 100,000 persons aged 15 years and older with bachelor degrees in these respective areas. For these indicators, British Columbia continues to be below the Canadian average.

Why are these indicators important?

Engineers and computer scientists are thought to be the driving force behind the high technology sector. Engineers and computer scientists are often engaged in the design of new software and hardware, and the discovery of innovative ways to integrate computers and software into other products.

Between 1990 and 1996, BC graduated far fewer bachelor degrees in Engineering per 100,000 persons than the other leading high technology provinces. The number of engineers graduating in BC peaked in 1995. In 1997, while BC remained far below the other provinces, it was the only province to remain constant. The other three provinces showed a decline in number of engineering graduates.

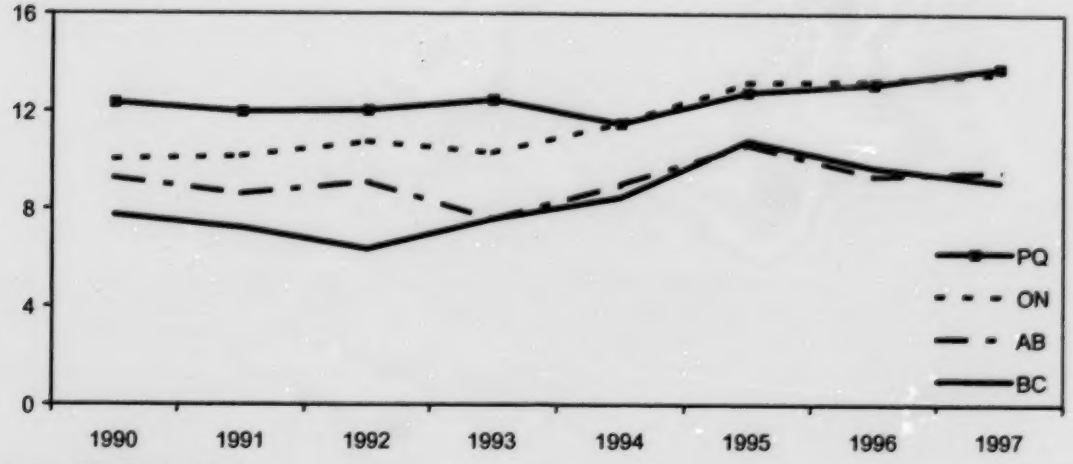
INDICATOR E-4: Engineering bachelor degrees awarded per 100,000 persons aged 15 years and older.



Source: Statistics Canada

Between 1990 and 1996, the number of BC graduates with a bachelors degree in Computer Science per 100,000 persons was low compared to the Canadian average. However, the proportion did increase slightly over this period. In 1997, the number of computer science graduates increased in all provinces except BC. Alberta and BC show a considerable lag behind Ontario and Quebec for this indicator.

INDICATOR E-5: Computer Science bachelor degrees awarded per 100,000 persons aged 15 years and older.



Source: Statistics Canada

Technology Acceptance

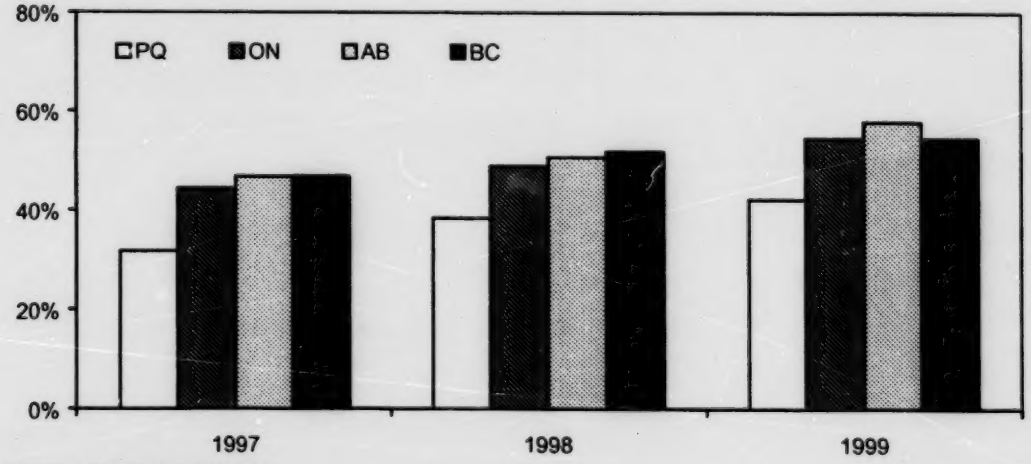
Canadians have been increasingly making use of new information technologies through the 1990s – the number of households with home computers reached 50% in 1999. Up to 1998, BC led the country with the highest penetration rates of home computer and Internet use.

Why are these indicators important?

The rate of technology acceptance is an indicator the willingness of the population to employ the advantages afforded by high technology. A population that is highly knowledgeable about computers and the Internet is thought to be a better producer and consumer of high technology products and processes. High technology businesses are attracted to locations where the population tends toward higher rates of technology acceptance. Also, the acceptance of internet and *e-business* technology means small businesses can reach a worldwide market, reduce the time and cost per transaction, and eliminate much of the capital investment required in typical 'bricks and mortar' operations.

Between 1997 and 1998, the number of Canadian households with computers grew 25%. From 1998 to 1999, this growth rate slowed to 10.7%. For the latter period, the growth rates in Alberta and Ontario were higher than the Canadian average. BC remained below the Canadian average growth rate for both periods. However, while BC's growth rate was low, BC has a large number of households with computers.

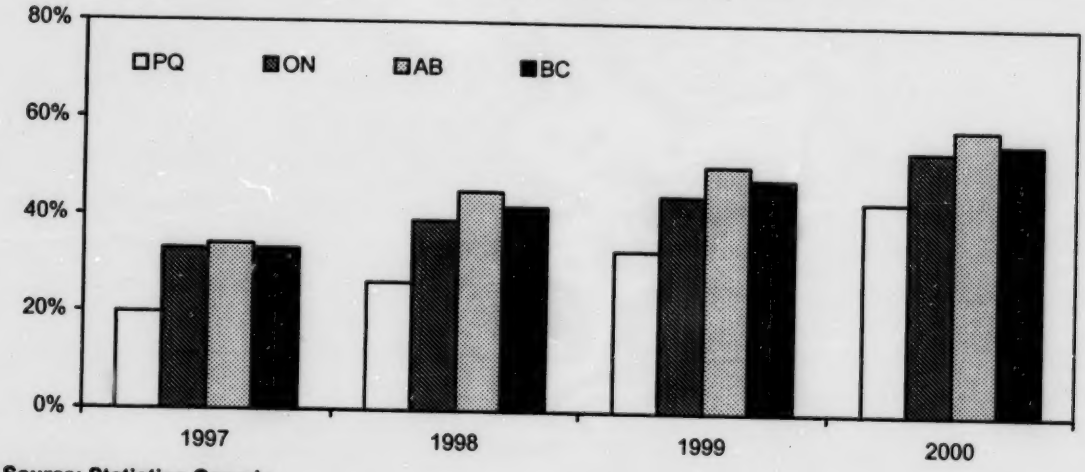
INDICATOR E-6: Percentage of households with home computers.



Source: Statistics Canada

For household internet use, Alberta led the country with the highest percentage between 1997 and 2000. BC held second place for the same period. Overall, Canada has an average growth rate of 21% in household internet use. While the percentage of people using the internet was lowest in Quebec, this province had the highest growth rate for the period. The remaining provinces had similar or slightly lower growth rates, compared to Canada. Household internet use includes access from home, work, school, libraries and other locations.

INDICATOR E-7: Percentage of households using the Internet from any location.

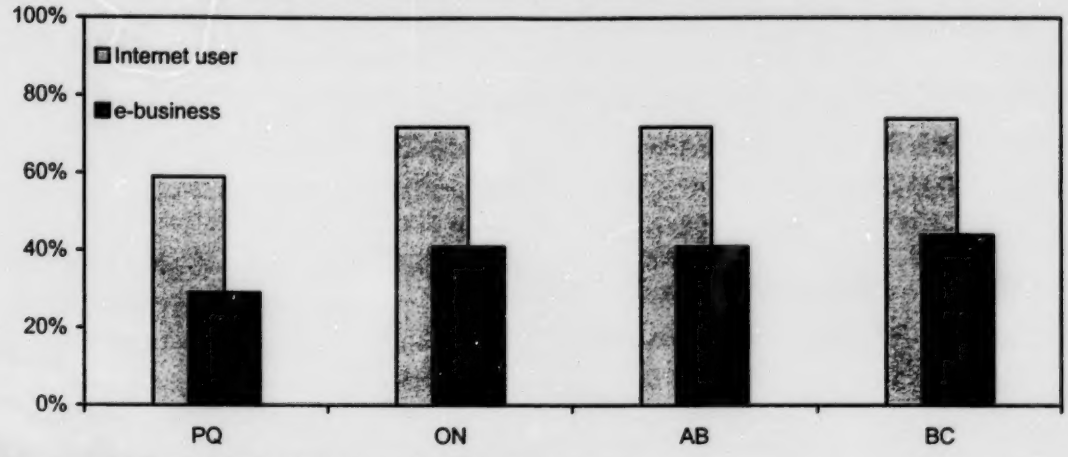


Source: Statistics Canada

Internet use by business can be classified in two broad categories, according to the Canadian Federation of Independent Businesses. Firms that access e-mail only are considered *internet users*. However, firms that have a web-site, or make transactions on-line are considered *e-businesses*.

In 2000, BC businesses led the other provinces in terms of the proportion of firms who use the internet and those who conduct 'e-business'. In all four provinces, approximately half of small businesses can be considered e-businesses.

INDICATOR E-8: Percentage of small businesses using the Internet.



Source: Canadian Federation of Independent Businesses

Technology Licensing

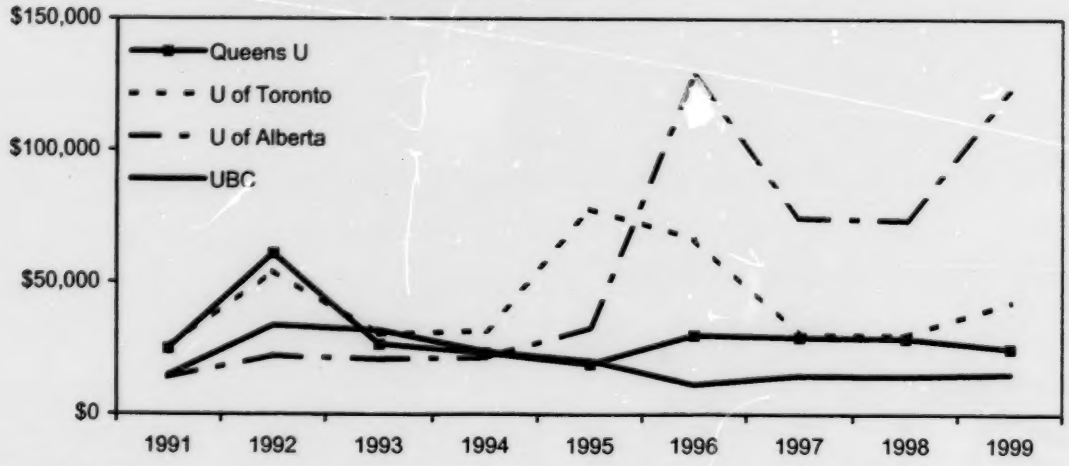
Across Canada, universities began to develop industry liaison offices in the mid-1980s. The University of Toronto office opened in 1980; UBC's University-Industry Liaison Office (UILO) opened in 1985; the University of Alberta office opened in 1987. These offices work with industry to spin-off technology developed at the university into successful companies.

Why are these indicators important?

Most universities now require staff to disclose all inventions to the university management. The university then has many options with respect to developing the invention, including licensing the technology to a private company. The average income per license is an indicator of the relative success of the companies who developing and marketing the technology as well as the importance of the original discovery. The number of US patents issued to universities is an important indicator of future revenues.

In 1999, UBC led Queen's University and the Universities of Alberta and Toronto in licenses that produced income but was last in terms of overall income from those licenses. In fact, between 1991 and 1999, the overall trend in income per technology license was down for UBC. By contrast, the University of Alberta increased its average annual return per license by a factor of 8, from just under $14,000 US in 1991 to over $122,000 US in 1999. During the same period, UBC's average annual return per license increased by just over $500 US.

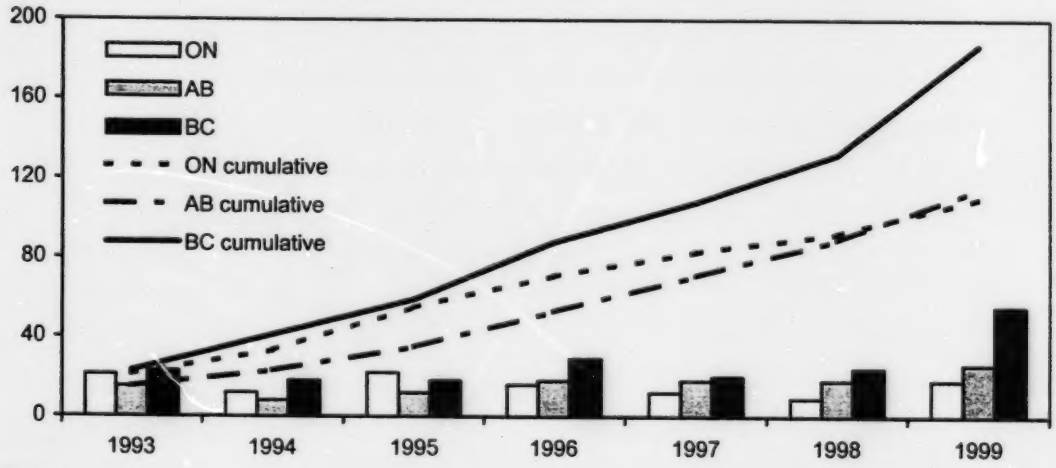
INDICATOR E-9: Gross income per technology license (in $ US).



Source: AUTM

BC led Alberta and Ontario between 1996 and 1999 in terms of the number of US patents awarded to its top two institutions.[4] Over the period, BC had a significant cumulative advantage amounting to 72 more patents than Alberta and 77 more than Ontario. In future years, as these patented discoveries are spun-off, this advantage may translate into higher revenues from technology licenses for BC.

INDICATOR E-10: US patents issued to top two institutions, actual and cumulative.



Source: AUTM

[4]The University of British Columbia and Simon Fraser University for BC; the Universities of Calgary and Alberta for Alberta; for Ontario, the University of Waterloo and Queen's University.

Performance of R&D by the Higher Education Sector

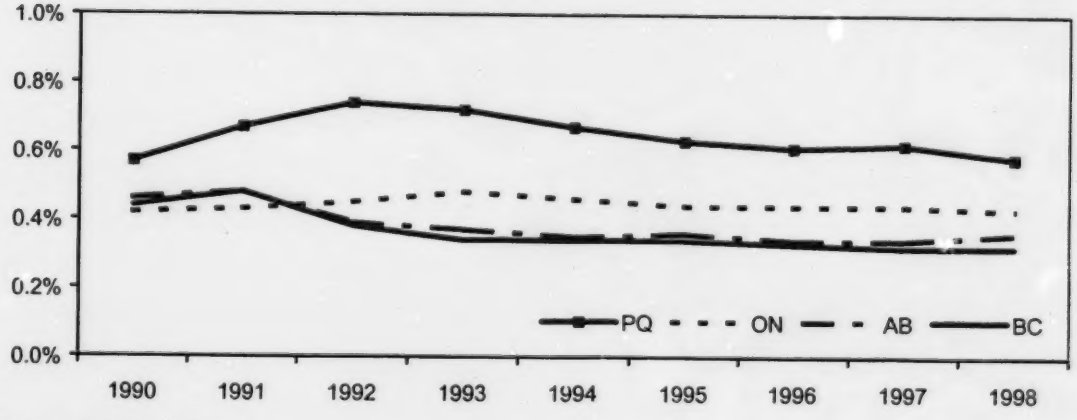
Overall, the higher education sector[5] in Canada performed $3.9 billion worth of R&D in 1998. This amounted to nearly 0.5% of Canada's GDP in that year. The ratio of R&D performed by the higher education sector to provincial GDP was highest in Quebec at 0.58% in 1998, which was higher than the Canadian average. Alberta and BC were lower than the Canadian average in 1998.

Why is this indicator important?

R&D in universities is important to the economy in two major ways. Firstly, academic research is published and available to the entire economy as a resource. Secondly, universities are increasingly working in partnership with industry to bring the products and processes of R&D to market (see "Technology Licensing"). The ratio of R&D performed by higher education to GDP is an indicator of the proportional investment in R&D by the higher education sector relative to the size of the overall economy. It is assumed that a higher proportion is likely to lead to higher rates of discovery.

Between 1992 and 1998, the Canadian ratio of higher education R&D to GDP declined. The ratio declined in all the high technology provinces, with the exception of Quebec in 1997, and Alberta in 1998. BC dropped from eighth overall in Canada in 1997 to ninth in 1998, ahead of Prince Edward Island only.

INDICATOR E-11: Ratio of higher education performance of R&D to GDP.



Source: Statistics Canada

[5]Does not include the Private Non-Profit sector.

BUSINESS INDICATORS

This set of indicators is concerned with the stimulus to business formation and growth that comes from internal R&D, patenting, and venture capital. It also measures results that are in part due to these stimuli, in the form of establishment entries and exits, "gazelle" companies, and the overall growth in the number of establishments.

Compared to other Canadian provinces, British Columbia returns average or below average ratings in all of the business stimulus indicators. However, many indicators have long-term upward trends and have shown good performance in the last two years. Exceptions are venture capital and business sector R&D. The proportional share of Canadian venture capital investment attracted by BC business has declined from the previous year. Business sector performance of R&D has also lagged, and the BC ratio of R&D performance by business to provincial GDP was half the ratio for Quebec and Ontario. In fact, in the last reporting year, this gap grew to a factor of three.

TABLE 3: Quick summary of indicators for the business sector.

INDICATORS	Trend	Latest year	Relative to other provinces
B-1: Patents per 10,000 persons	↑	↑	below average
B-2: Patent applications per 10,000 persons	↑	↑	below average
B-3: Entries and exits into the high technology sector	↑	↑	n/a
B-4: # of establishments in the high technology sector	↑	↑	n/a
B-5: # of gazelles (high growth companies)	↑	↑	n/a
B-6: Venture capital investment	↑	↑	average
B-7: Venture capital investment: share of Canadian total	→	↓	average
B-8: Venture capital investment per capita	↑	↑	below average
B-9: Business performance of R&D to GDP ratio	→	↓	below average

Patents and Applications

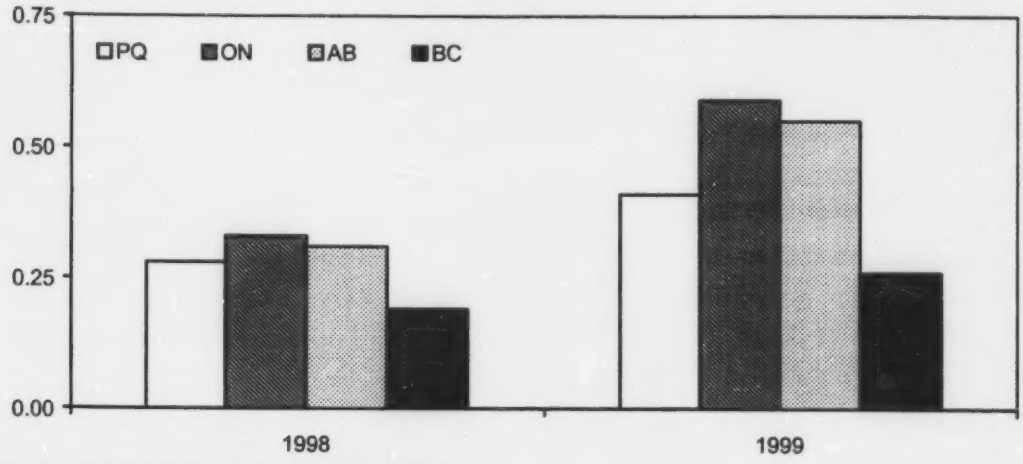
The application for and granting of patents are indicators of the success of R&D, whether in the public or private sector. Through the 1990s, BC lagged the high technology provinces in terms of both patent applications and patents awarded per 10,000 persons. This trend seems to continue in 1998 and 1999. However, the data from the Canadian Intellectual Property Office has changed and is not comparable to the previous report. In this edition of the report, the data for these indicators is reported by province of residence of applicant.

Why are these indicators important?

Patents represent the intellectual capital of innovation. According to the Canadian Intellectual Property Office, "Patents are government grants that give inventors exclusive rights to their inventions.... Patents are granted for products or processes that are new, workable and ingenious (novel, useful and inventive). In this way, patents serve as a reward for ingenuity.... [Also,] Patents....are an important means of sharing know-how, because each patent document describes a new aspect of a technology in clear and specific terms and is available for anyone to read. Eighteen months after a filing, the document is made public. This is done specifically to promote the sharing of knowledge. Patents are vital resources for businesses, researchers, inventors, academics and others who need to keep abreast of developments in their fields."

While across Canada, patents awarded increased from 1998 to 1999, BC continued to lag the other high technology provinces in this respect. Nation-wide, BC was sixth in terms of patents awarded per 10,000 persons, while Ontario, Alberta and Quebec were first, second and third, respectively.

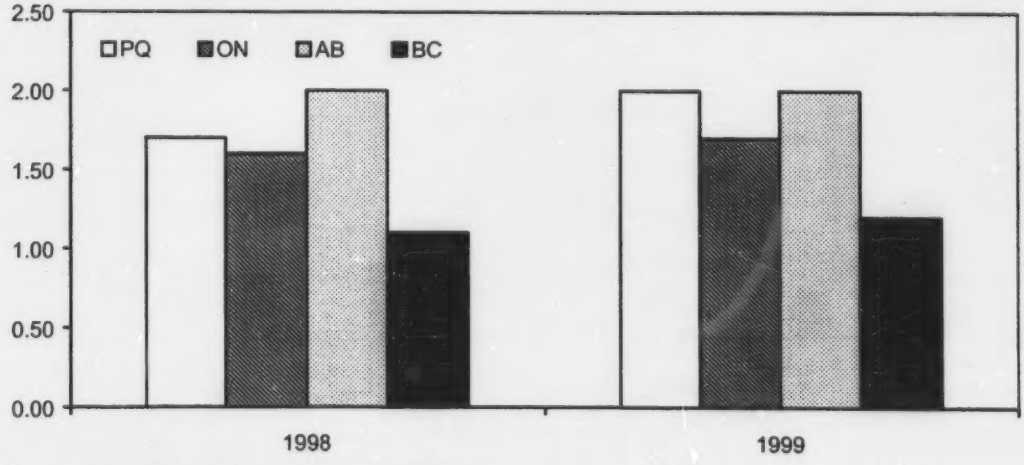
INDICATOR B-1: Patents awarded per 10,000 persons.



Source: Canadian Intellectual Property Office

Patent applications are a critical determinant of patents granted, although there is not necessarily consistency in the number of patents granted per patent application. Patent applications per 10,000 persons rose steadily across the country through the early part of the 1990s. From 1998 to 1999, patent applications per 10,000 rose slightly in each of the high technology provinces, except Alberta. However, Alberta still ranked first in applications per 10,000 persons across the country. Quebec and Ontario were second and third, while BC was fifth nation-wide.

INDICATOR B-2: Patents applications per 10,000 persons.



Source: Canadian Intellectual Property Office

Sector Dynamism: Entries and Exits

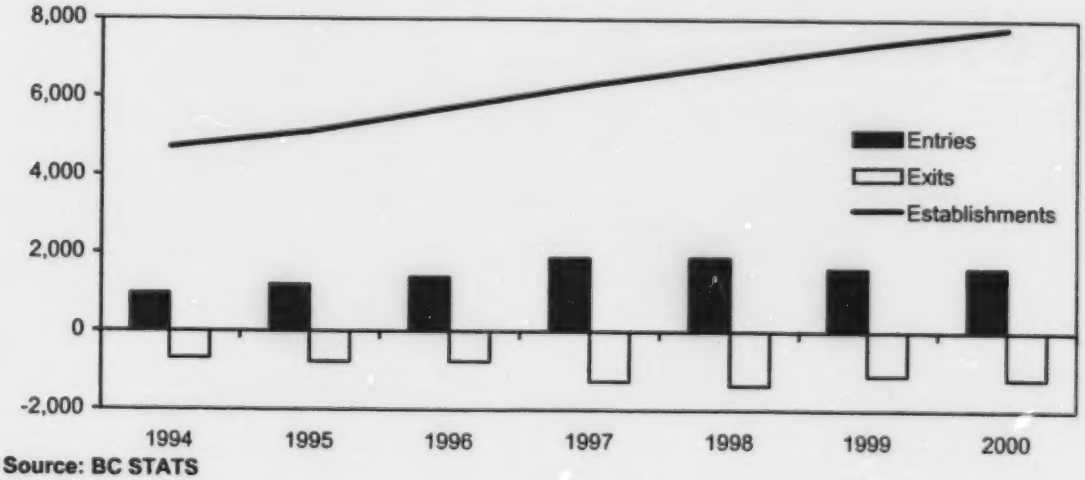
An indicator of the vibrancy of the innovation economy is the number of entries and exits to the high technology sector. BC's high technology sector is characterized by a high rate of entries and exits – sector dynamism peaked in 1997 with an entry rate of 33% and an exit rate of 22%.

Why are these indicators important?

A dynamic sector, characterized by a healthy mixture of large and small, old and new firms, is ideal for generating high levels of innovation. Large, established firms provide employment and earnings stability while small start-ups provide market responsiveness and employment growth. Firms that do not succeed are quickly dissolved or absorbed into other more successful firms. The high technology labour force is combined and recombined with capital and ideas in the drive to generate new goods and services. A stagnant sector, characterized by several large firms and low levels of entry and exit, is not likely to generate high levels of innovation.

Overall, the number of firms in the sector grew at an average annual compound rate of 8.4% in the seven years between 1993 and 2000. The sector grew from over 4,400 firms to nearly 7,800 during that period. By contrast, the number of firms in the whole BC economy grew at an average annual compound rate of 2.4%. The number of firms in BC's high technology sector grew fairly steadily through the 1990s, indicating that the sector was in a period of significant expansion.

INDICATORS B-3 and B-4: Entries and exits to the BC high technology sector.



Source: BC STATS

Gazelles: High Growth Companies

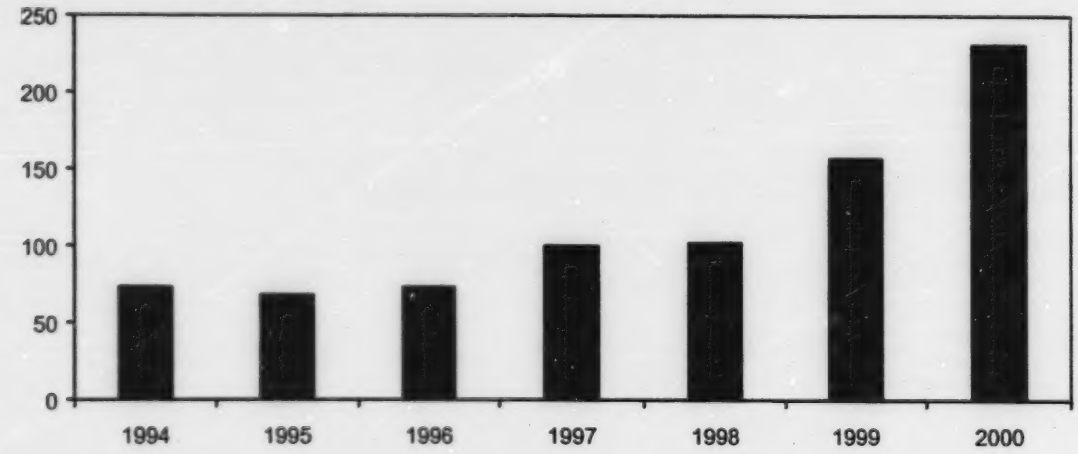
High technology companies exhibiting high levels of growth are indicative of the potential of the high technology sector. A "gazelle"[6] is a company that bounds ahead of others by growing at a very rapid rate. BC has shown growth in the number of such companies through the middle period of the 1990s.

Why is this indicator important?

High levels of growth are strong indicators of the success of the sector. Just as plants grow fastest when conditions are best—lots of light, water and nutrients—so too with firms. It is assumed that a firm cannot grow rapidly without the fundamental elements of growth—access to capital, skilled labour and markets—in place. Also, companies that create large amounts of new employment are the "payback" to the economy for efforts taken to foster the growth of the sector. An increasing number of high growth companies creates new jobs, new wealth, and new government revenues.

The number of high growth companies in the BC high technology sector reached a low of 68 in 1995 and has risen steadily to over 230 in the most recent year.

INDICATOR B-5: Growth companies in the BC high technology sector.



Source: BC STATS

[6] "Gazelle" companies are referred to in the *1997 Massachusetts Index* as publicly traded companies that have grown at an annual average compound rate of 20% or more for the last four years. BC STATS has devised a methodology to identify high growth companies in the BC high technology sector that involves counting the number of companies whose employment size increased two categories in a given year. However, as methodologies differ, this number is not comparable to other jurisdictions.

Venture Capital Investment

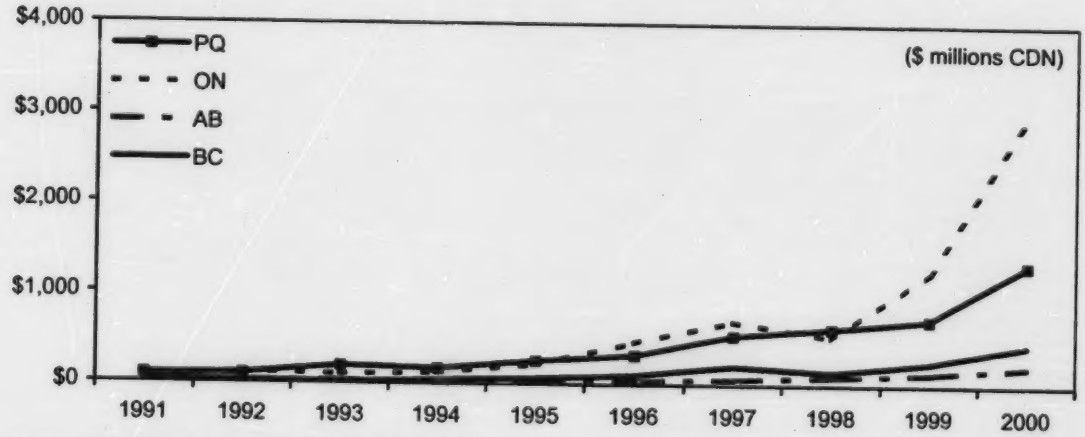
In the last ten years, Canadian venture capital investment has grown 30%, reaching $5.1 billion dollars in 2000. This total does not include foreign investment, which topped $1.2 billion in 2000. Venture capital investments have doubled since 1999. Investments in the high technology provinces follow the same trends.

Why are these indicators important?

Venture capitalists – investors who invest in high-risk company start-ups or expansions – are constantly considering whether the reward justifies the risk. Most venture money is lost when the investment does not play out, but those companies that do succeed often have a very large payback. In assessing whether or not a company will succeed, many other conditions aside from the quality of the company itself must be considered, including the business climate in the jurisdiction in which the venture is located. In this way, venture capital investment by province is a good proxy for both the quality of ventures in a given province as well as the venture capitalists' assessment of the business climate.

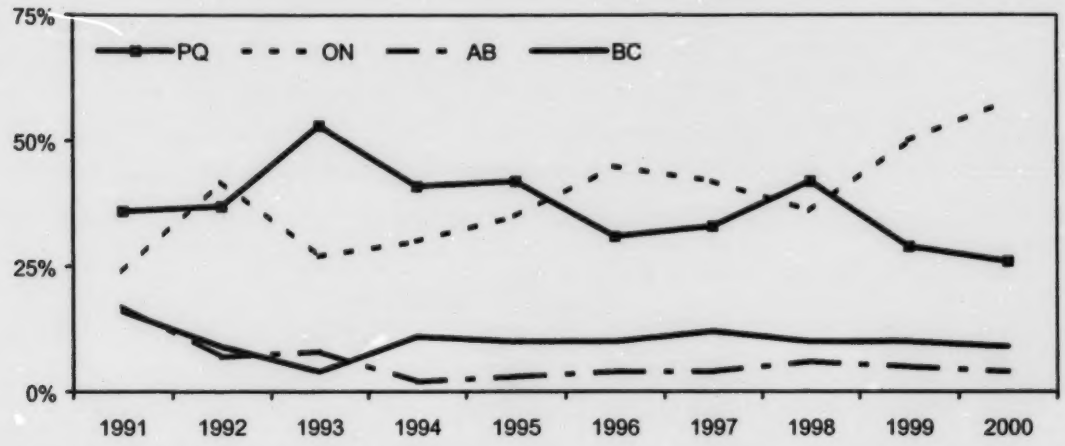
Venture capital investment in BC tripled between 1998 and 2000. This growth, however, was dwarfed by the increase in investment in Ontario which grew by over five times in the same time period. In 2000, Ontario captured over half of all venture capital investment in the country, while BC's proportion was 8.8%. Alberta attracts less venture capital investment at 4.2% of the Canadian total.

INDICATOR B-6: Canadian venture capital investment by investee province.



Source: Canadian Venture Capital Association

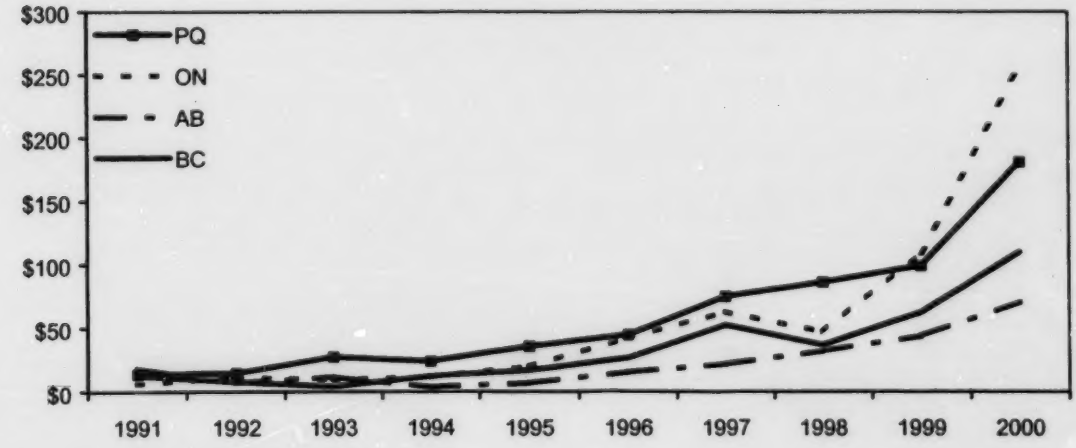
INDICATOR B-7: Proportional share of Canadian venture capital investment.



Source: Canadian Venture Capital Association

In 1991, Alberta led all the leading high technology provinces in venture capital investment per capita at over $18. Ontario was the lowest of the four provinces with just over $6 per capita. In 2000, Alberta trailed the other three provinces, with $70 per capita, while Ontario's per capita investment was $254. BC and Quebec had a similar growth rate of per capita venture capital investment between 1999 and 2000. Ontario more than doubled its venture capital investment per capita in the same period.

INDICATOR B-8: Canadian venture capital investment per capita.



Source: Canadian Venture Captial Association

Performance of R&D by the Business Sector

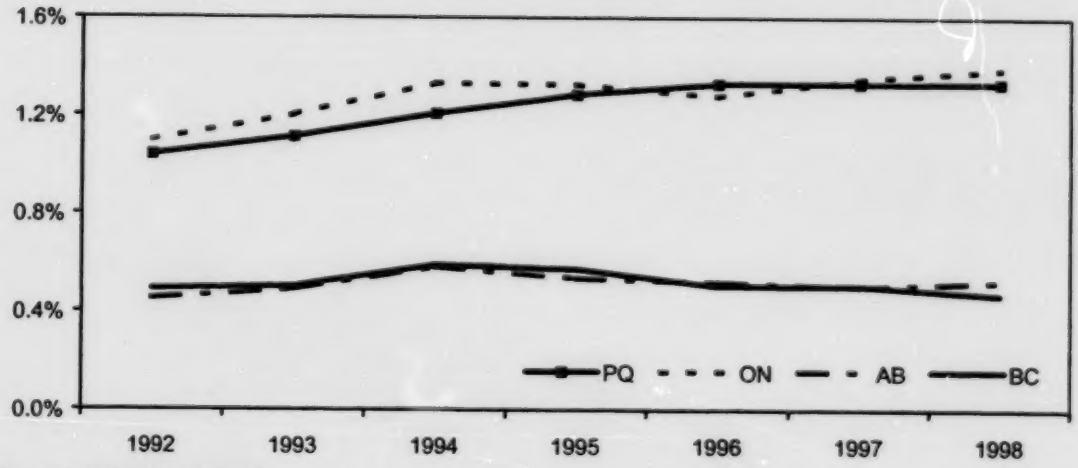
In 1998, the business sector in Canada performed $9.1 billion worth of R&D, amounting to just over 1% of Canada's GDP in that year. Throughout the 1990s, the ratio of business R&D to provincial GDP was much higher than the Canadian average in Quebec and much lower in BC and Alberta. In the last reporting year, the ratio increased in all high technology provinces except BC.

Why is this indicator important?

New products and processes, and the services required to help customers use and maintain new products and processes, are often the outcome of R&D. In this way, R&D is viewed as a reinvestment in the future production of the economy. The ratio of R&D performed by business to GDP is an indicator of the proportional investment in R&D by the business sector relative to the size of the overall economy. It is assumed that a higher proportion is likely to lead to higher rates of discovery.

The Canadian ratio of business R&D to GDP in 1998 was entirely driven by Quebec and Ontario, due to the sheer magnitude of the R&D investments by businesses in those provinces. The ratio of business R&D to GDP in Quebec and Ontario was approximately three times ratio for Alberta and BC.

INDICATOR B-9: Ratio of business performance of R&D to GDP.



Source: Statistics Canada

GOVERNMENT INDICATORS

The government sector affects high technology firms by providing a regulatory, tax, and infrastructure environment, by funding R&D, and by directly performing certain R&D. The tax regime is fairly similar across provinces. Quebec has a considerably lower corporate tax rate than other provinces, while BC and New Brunswick have the lowest small business tax rate. Direct performance of R&D by government has lagged in BC compared to other provinces.

This section also includes a summary of British Columbia's gross expenditure on R&D (GERD). This includes R&D performed by higher education and business, in addition to government.

TABLE 4: Quick summary of indicators for the government sector.

INDICATORS	Trend	Latest year	Relative to other provinces
G-1: Personal tax index for $80,000 income	↓	↓	below average
G-2: Small business tax rate	↓	↓	below average
G-3: Corporate tax rate	→	→	above average
G-4: Government performance of R&D to GDP ratio	→	↓	below average
G-5: Gross expenditure on R&D (GERD) to GDP ratio	↓	↓	below average

Tax Rates: Individual and Corporate

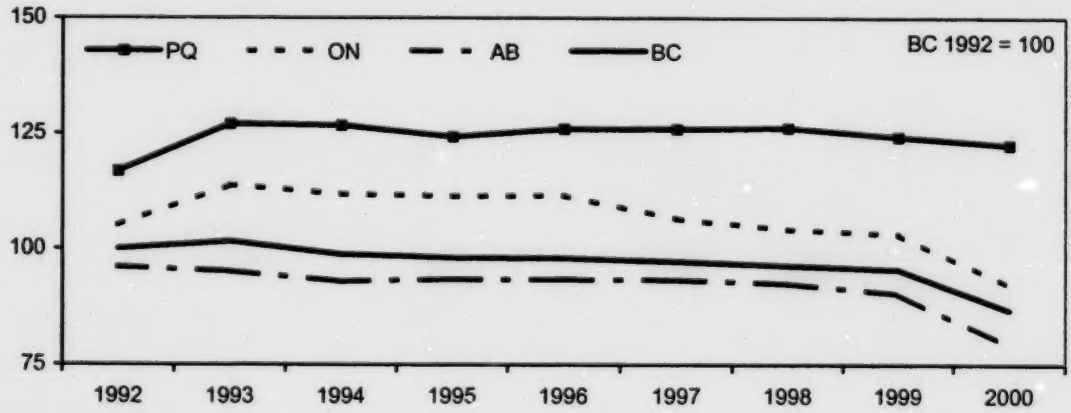
Tax rates are one significant policy area over which the government has complete control. Lower levels of taxation are thought to attract investment and a skilled workforce—both essential to the high technology sector. However, a better quality of life associated with regulation of working conditions, environmental standards, and universal social programs is thought to be attractive to high technology workers. These amenities generally result in higher levels of taxation.

Why are these indicators important?

High technology companies differ significantly from traditional companies as they do not require proximity to raw materials or to markets. Therefore, high technology companies are often free to seek an ideal location. Companies do, however, require skilled labour. If the skilled labour is not available locally, they need to be able to attract it. Individual tax rates are seen to be an important determinant in the choice to locate in a given area. Also, small business corporate tax rates are thought to affect the rate at which young companies can grow—the less the government takes in the early years the more that can be reinvested in the company. Corporate tax rates for large companies may also be a major determinant in the choice of location for head offices, regional branches and manufacturing plants.

The level of taxation in BC for high-income single people has declined since its peak in 1993. BC's position relative to Alberta and Ontario has changed little since 1992. Personal tax rates declined substantially in 2000 for BC, Alberta and Ontario.

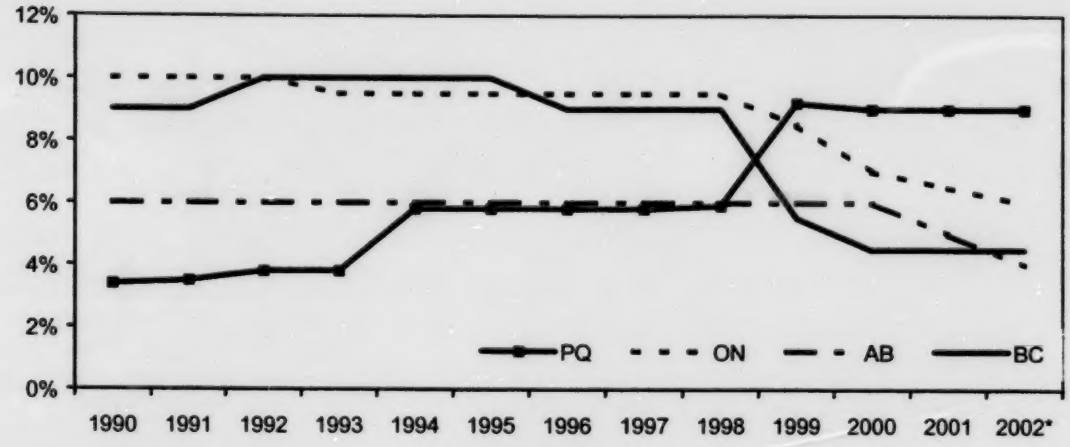
INDICATOR G-1: Index of all taxes paid by unattached individuals earning $80,000 per year.



Source: BC STATS

BC's small business tax rate rose in 1992, then declined in 1996 and 2000 to become one of the lowest small business tax rate of the leading high technology provinces. Alberta's proposed small business tax rate for 2002 will be slightly lower than the BC tax rate. Quebec's tax rate increased in 1999 and is now double the rate in Alberta and BC.

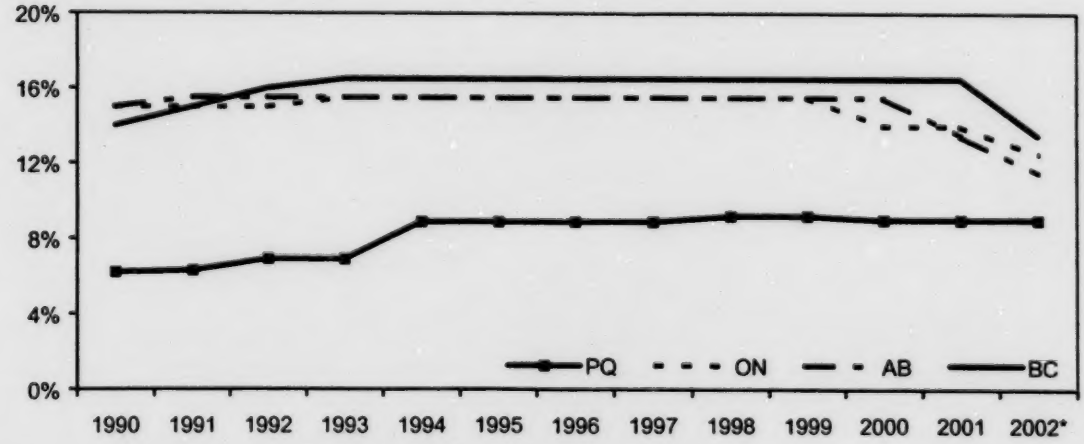
INDICATOR G-2: Small business tax rate.



Source: BC Ministry of Finance (2002 rates are projected)

BC's corporate tax rate rose in the early 1990s to its current level. In 2001, BC initiated corporate tax cuts similar to the recent cuts in Alberta and Ontario. While Quebec's corporate tax rate has increased slightly in the last 10 years, this province has lowest rate in the country.

INDICATOR G-3: General corporate tax rate.



Source: BC Ministry of Finance (2002 rates are projected)

Performance of R&D by the Government Sector

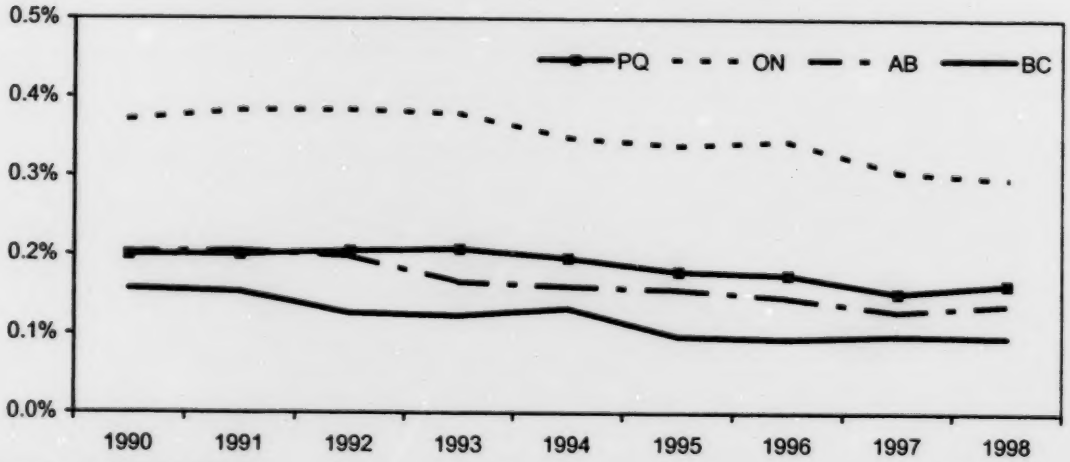
Overall, the government sector in Canada performed $1.73 billion worth of R&D in 1998, up slightly from 1997. This amounted to nearly 0.2% of Canada's GDP in that year. However, the Canadian ratio of government R&D to GDP has steadily decreased between 1990 and 1998.

Why is this indicator important?

Government tends to fund much more R&D than it actually performs. However, in some fields, governments do maintain research personnel in order to provide independent testing of products, processes and practices. The purpose of most internal government research is not necessarily focused on innovation, but serves a peer review function. Significant innovations developed by government researchers are often spun-off to the private sector. The ratio of government R&D to GDP is an indicator of the proportional investment in R&D by the government sector relative to the size of the overall economy.

Within the high technology provinces, Ontario has maintained the highest ratio of government R&D to GDP during the 1990s. BC's ratio has consistently ranked last compared to all provinces over this period; Alberta has held the 9th place rank. The BC ratio was less than half the Canadian average between 1992 and 1998. The ratios for Quebec and Alberta increased slightly in 1998.

INDICATOR G-4: Ratio of combined federal and provincial performance of R&D to GDP.



Source: Statistics Canada

Gross Expenditure on R&D

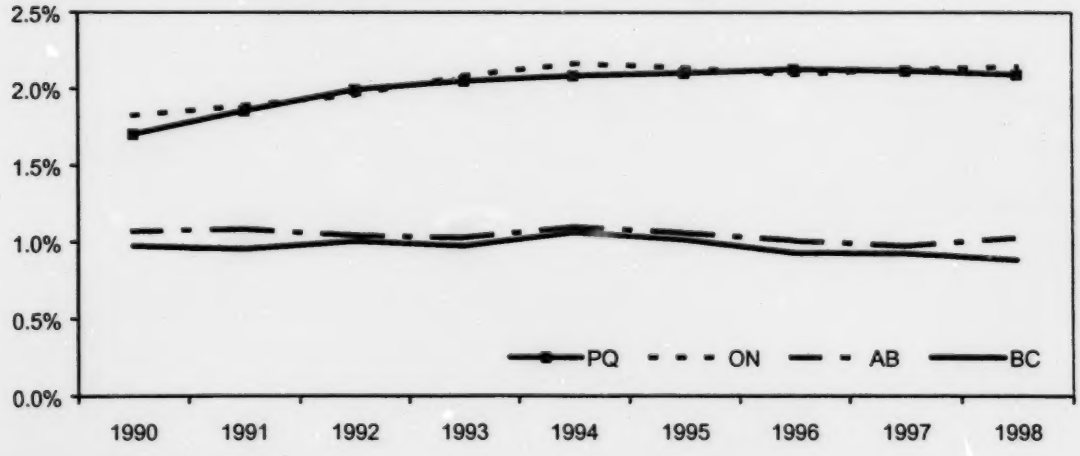
The gross Canadian expenditure on research and development (GERD) was $15.2 billion in 1998, amounting to 1.68% of Canada's GDP in that year. Across Canada, the GERD to GDP ratio fell after reaching a peak in 1994 at 1.74%. However, the ratio has increased each year since 1996.

Why is this indicator important?

The overall ratio of the total R&D effort to the overall economy, also known as the GERD ratio, is a measure of how much a jurisdiction is willing to sacrifice current consumption for increased future capacity. The changing structure of the ratio (the relative size of the component investments by the government, business and higher education sectors) over time is a measure of the shifting importance different sectors place on performance of R&D. The meaningfulness of the GERD ratio has been challenged in recent times. However, the measurement of R&D effort as an indicator for the high technology sector remains a primary objective of national statistical agencies.

The GERD to GDP ratios for Quebec and Ontario have been very close throughout the 1990s, rising from 1.8% to 2.1%. These ratios have been consistently higher than the Canadian average. The ratios for BC and Alberta hovered at approximately 1% of GDP during the period. In 1998, Alberta's ratio rose to 1.03% while BC's dropped to 0.88%. Alberta and BC were ranked fourth and seventh, respectively, in Canada for that year.

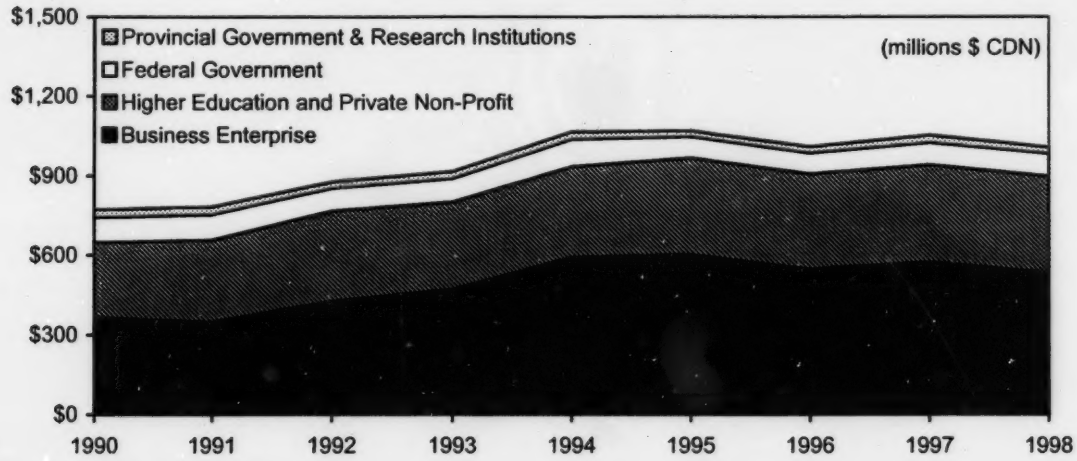
INDICATOR G-5: Ratio of total expenditure on R&D to GDP.



Source: Statistics Canada

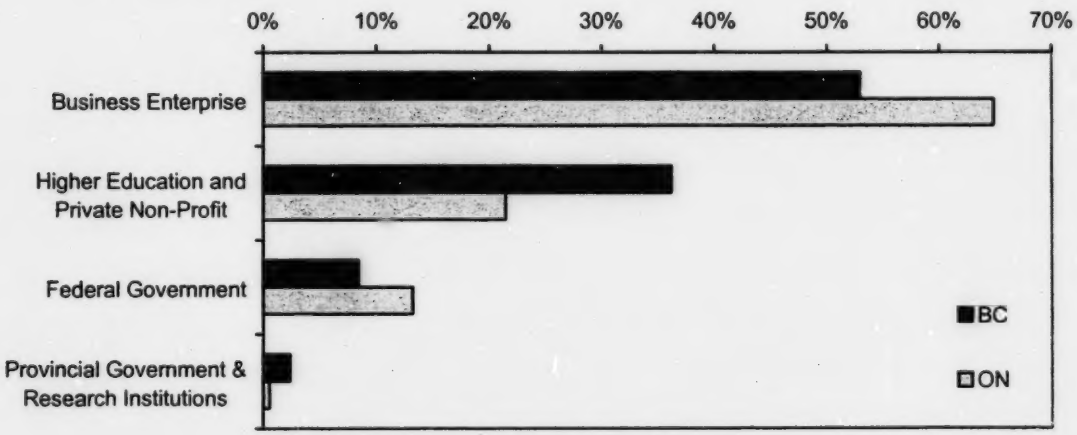
The largest single performer of R&D in BC is the business sector. Businesses performed 53% of R&D in 1998, down from 60% in 1997. By comparison, Ontario's business sector performs 65% of R&D in the province. BC's education sector performed over a third of the R&D, while the same sector in Ontario performed just over 20% of the R&D. The proportion performed by the federal government was higher in Ontario, compared to BC.

FIGURE 1: Profile of the BC total expenditure on R&D.



Source: Statistics Canada

FIGURE 2: Share of provincial R&D expenditures by sector for BC and Ontario in 1998.



EXTERNAL INDICATORS

The British Columbia economy is part of a world system that provides information, skilled labour, machinery and equipment, and other material inputs, as well as markets for locally-produced products. Conversely, British Columbia may lose skilled labour to other jurisdictions or face competition from foreign producers.

Canada, and British Columbia, benefit from a large number of well-trained immigrants. The number of these immigrants has increased greatly in recent years, and their level of schooling has increased as well. Relative its population size, British Columbia is on a par with other provinces in attracting skilled foreigners. As for in-migration from other provinces, BC is likely to gain educated and trained workers when there is migration from other provinces. However, since 1998, BC has been experiencing inter-provincial out-migration. BC imports of high technology goods, which can be an indicator of future production, dropped in 1996 but have been steadily increasing in the past few years.

TABLE 5: Quick summary of indicators for the external sector.

INDICATORS	Trend	Latest year	Relative to other provinces
X-1: Number of immigrants with higher education	↑	↑	average
X-2: Education level of immigrants	→	→	average
X-3: Net inter-provincial migration	↓	↑	below average
X-4: High technology imports	↑	↑	n/a

Educational Attainment of Immigrants

British Columbia experienced high levels of immigration in the 1990s, and this trend continued in 2000. Two indicators of immigrant educational attainment are:

1. the percentage of immigrants aged 25 years and older with 16 or more years of education (sufficient to obtain a university degree in BC),
2. the median years of education of immigrants aged 25 years and older at landing.

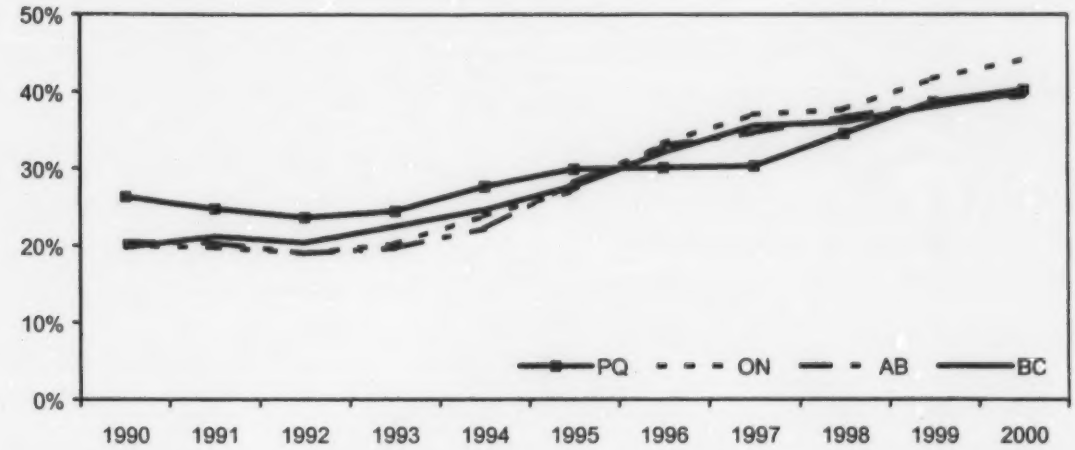
According to these two measures, immigrants to BC tend to be less well-educated than immigrants to other provinces, particularly the leading high technology provinces. However, in absolute numbers, BC received nearly 85,000 immigrants with 16 or more years of education in the 1990s—more than any other province except Ontario and 19% of the Canadian total for that period.

Why are these indicators important?

These indicators measure the flow of educated, skilled workers into British Columbia. These workers often bring knowledge of other business practices and business opportunities, as well as languages. This firsthand knowledge is vital to those BC companies looking to expand exports or enter new markets. Immigrants also offset the loss of skilled workers who move to other provinces or out of Canada.

The percentage of educated immigrants grew dramatically in the last 10 years. BC and Quebec fared well compared to the leading high technology provinces in the early 1990s, but lost ground to Ontario and Alberta in the late 1990s. In 2000, Ontario had the highest percentage of immigrants with 16 or more years of education (44%), followed by the other provinces at 40%.

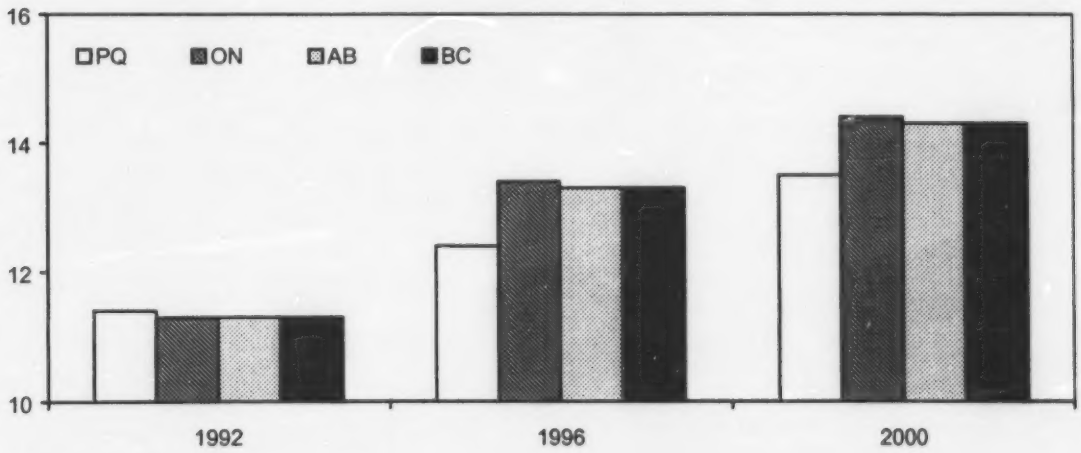
INDICATOR X-1: Percentage of immigrants aged 25 years and older with 16 or more years of education.



Source: BC STATS

The median years of schooling of immigrants aged 25 years and older increased through the 1990s. The Canadian median has increased substantially from 11.3 years of education to 14.3 years between 1992 and 2000. BC has remained steady with the Canadian median during the period.

INDICATOR X-2: Median years of schooling of immigrants 25 years and older.



Source: BC STATS

Inter-provincial Migration

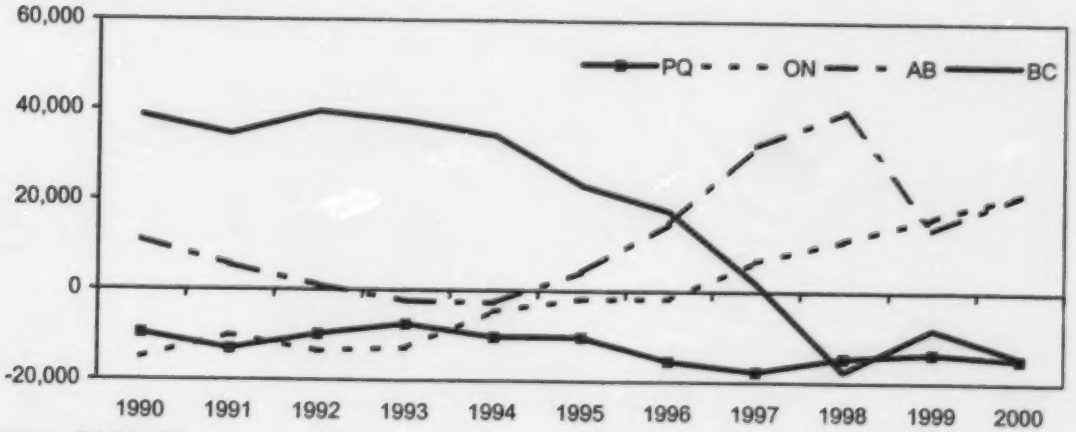
People seeking better economic opportunities largely drive the pattern of inter-provincial migration in Canada. In the early 1990s, there was a general westward flow of migrants that benefited both BC and Alberta. In recent years, the general direction of flow changed, and people began moving east – mostly to Alberta and Ontario, but also to several Maritime provinces.

Why is this indicator important?

Workers in Canada are much more free to move within the borders of the country than they are internationally. In aggregate, the movements of skilled and educated workers between provinces is a general indicator of both real and perceived economic opportunity. Individuals and families leave when they feel the grass is greener somewhere else. In this way, this indicator points to the overall perception of the strength of provincial economies.

Up to 1994, BC had a large net inflow while all other provinces had net outflows. The last year in which BC showed dramatic net inflows was 1996, although by that time BC's net inflow was already down substantially from its high of nearly 40,000 in 1992. In 1997, Ontario began to show a net inflow while Alberta, which had been showing positive in-migration since 1995, grew substantially. Alberta showed a dip in net in-migration 1999, but in 2000, the figures increased for both Alberta and Ontario. BC showed net out-migration in the late 1990s. Quebec, lost between 7,400 and 17,500 people every year through the 1990s. This has likely resulted in a significant loss of skilled and educated workers from Quebec.

INDICATOR X-3: Net inter-provincial migration.



Source: BC STATS

High Technology Imports

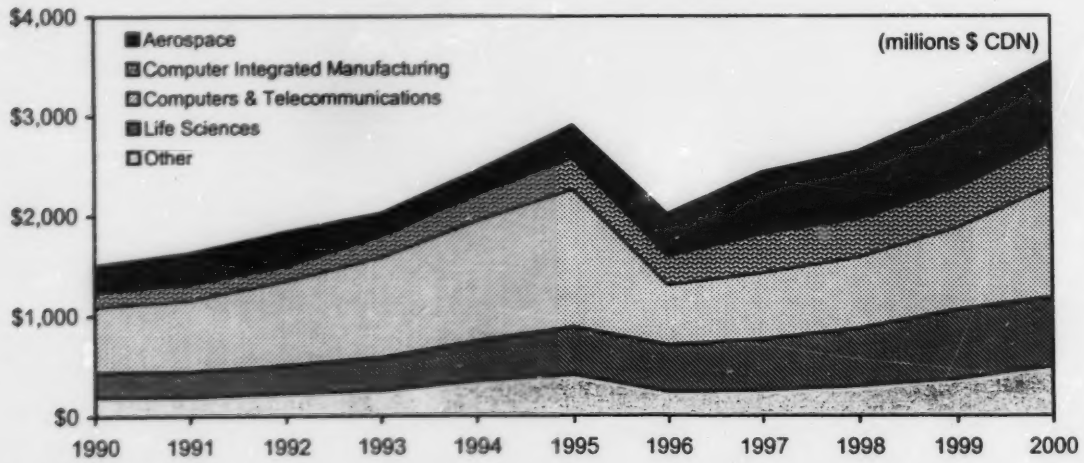
BC's high technology sector is reliant on imports of high technology goods in order to thrive. Imports of high technology goods peaked in 1995 at $2.9 billion, but declined sharply in 1996 to $2.0 billion. By 1998, despite a weak Canadian dollar, imports rose again to $2.6 billion. In 2000, imports reached their highest level to date at $3.5 billion.

Why is this indicator important?

Although a heavy reliance on imports can create a negative trade balance (the difference between the value of goods exported and the value imported), imports of high technology goods are often essential in order to generate future exports of both goods and services. For instance, without state-of-the-art telecommunications, the high technology sector as a whole will struggle. Similarly, purchases of computer integrated manufacturing technology will displace future imports of other goods, whether high technology or low technology goods, and possibly will generate goods for export.

Before 1996, imports of computers and telecommunications products represented over 40% of all high technology imports to the province. However, that year, the unadjusted value of these imports fell 57%, from nearly $1.4 billion to $0.6 billion. Since then, computers and telecommunications products represented less than 30% of all high technology imports. In that period, aerospace, life sciences products, and computer integrated manufacturing have become a higher proportion of the high technology imports. In 2000, however, the import of computer and telecommunications products began to rise again.

INDICATOR X-4: Value of high technology imports to BC.



Source: BC STATS

LABOUR INDICATORS

Most of the indicators in this report are grouped according to the sector that provides or affects the input. However, in the case of the labour input, indicators such as the unemployment rate are not attributable to a single source sector. This section contains a set of indicators that are specific to the labour market but represent a combined impact of the source sectors.

Unemployment rates among workers in the natural and applied sciences are well under half of those in the economy overall. Further, these unemployment rates have been falling quite consistently since the early 1990s.

TABLE 6: Quick summary of indicators for labour.

INDICATORS	Trend	Latest year	Relative to other provinces
L-1: Unemployment rate for natural and applied sciences	↓	↓	below average
L-2: Ratio of unemployment rate for natural and applied sciences to the unemployment rate for all occupations	↓	↓	below average
L-3: Research personnel per capita	↓	↓	below average

Unemployment Rate in Natural and Applied Sciences

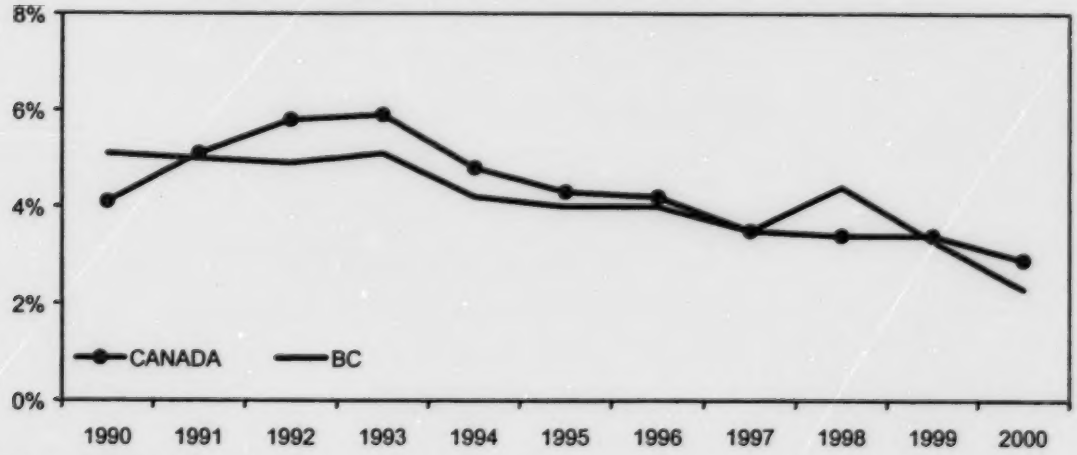
Across Canada, the highest unemployment rate for all occupations was 11.4% in 1993. The highest rate of unemployment for natural and applied sciences was 5.9% in the same year. Throughout the 1990s, persons employed in the natural and applied sciences occupations have enjoyed an employment advantage compared to the entire labour force.

Why are these indicators important?

A low level of unemployment in natural and applied sciences occupations is desirable because some components of this group (e.g. computer scientists) are the engines of innovation in the high technology economy. Higher levels of unemployment in this group indicates idle intellectual capital which has the effect of slowing the overall rate of innovation. Also, a lower ratio between the unemployment rate for natural and applied science occupations and the overall labour force indicates heightened demand for these specializations. This should attract high tech workers from other jurisdictions as well as more students into these areas of specialization.

During most of the 1990s, BC had a lower rate of unemployment for natural and applied science occupations than the Canadian average. In 2000, the BC unemployment rate for natural and applied sciences reached a decade low of 2.3%. BC also had the lowest unemployment rate in these occupations nation-wide.

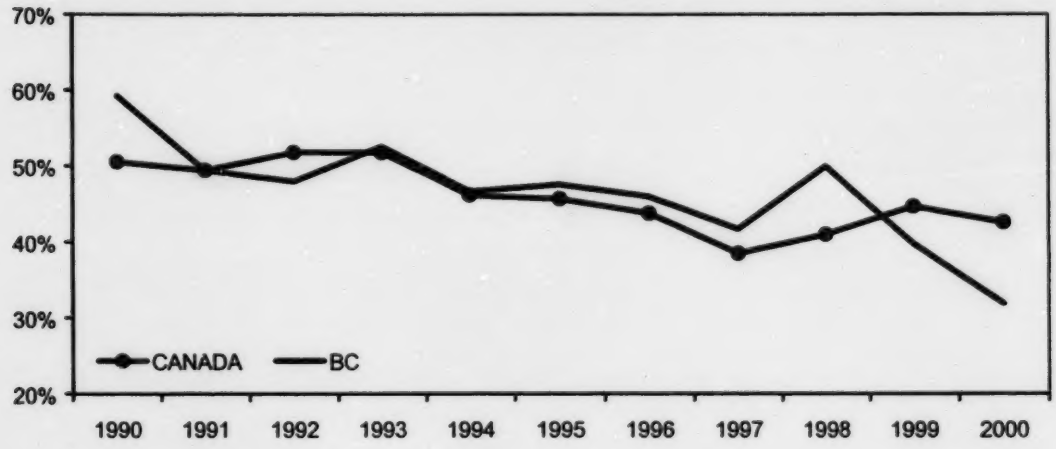
INDICATOR L-1: Unemployment rate for natural and applied sciences occupations.



Source: Statistics Canada

During the 1990s, the Canadian ratio has shown an overall downward trend downward, indicating an increasing advantage in employment to persons in these occupations. BC's ratio of unemployment in natural and applied sciences occupations to the total labour force dropped nearly 8 percentage points to reach a decade low in 2000.

INDICATOR L-2: Ratio of unemployment rates for science occupations to total labour force.



Source: Statistics Canada

Research Personnel

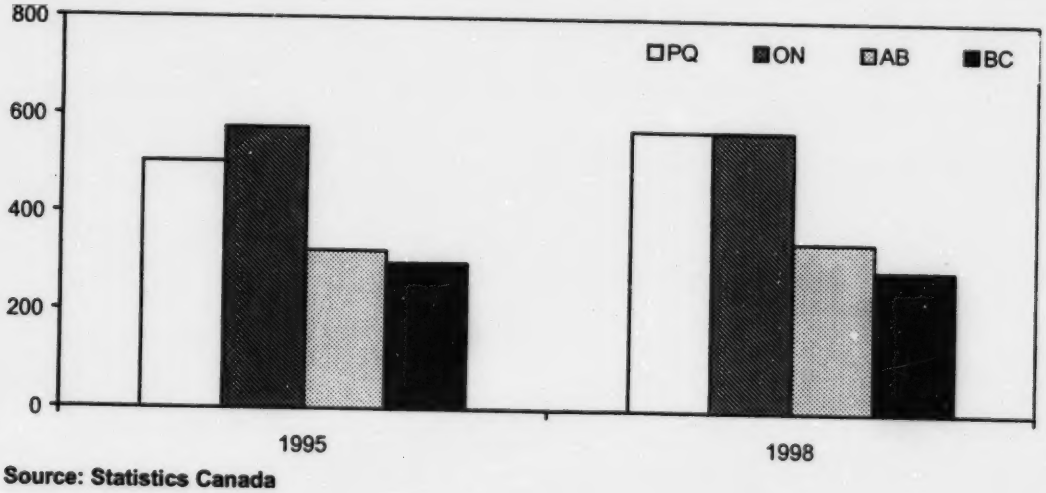
In 1998, there were approximately 480 researchers per 100,000 persons, working in government, business and higher education across Canada. Business and higher education claimed the largest shared of Canadian research personnel (55% and 31%, respectively).

Why is this indicator important?

The absolute number of researchers and technicians engaged in research is an important determinant to the volume of scientific and technical discoveries that may result in patent applications, and later, in the birth of new firms or the growth of existing firms. The structure of the research workforce is important in terms employment sector, whether federal government, provincial government, business enterprise or higher education. Each sector has different reasons for developing new technology and different methods of bringing new discoveries to market.

British Columbia's workforce of researchers and technicians was the fourth largest per 100,000 persons across Canada in 1998, up from an eighth place rank in 1995. While the number of researchers in BC increased only slightly in 1998, several other provinces' total number of researchers decreased. Ontario has the largest research workforce per 100,000 and in absolute numbers, followed by Quebec.

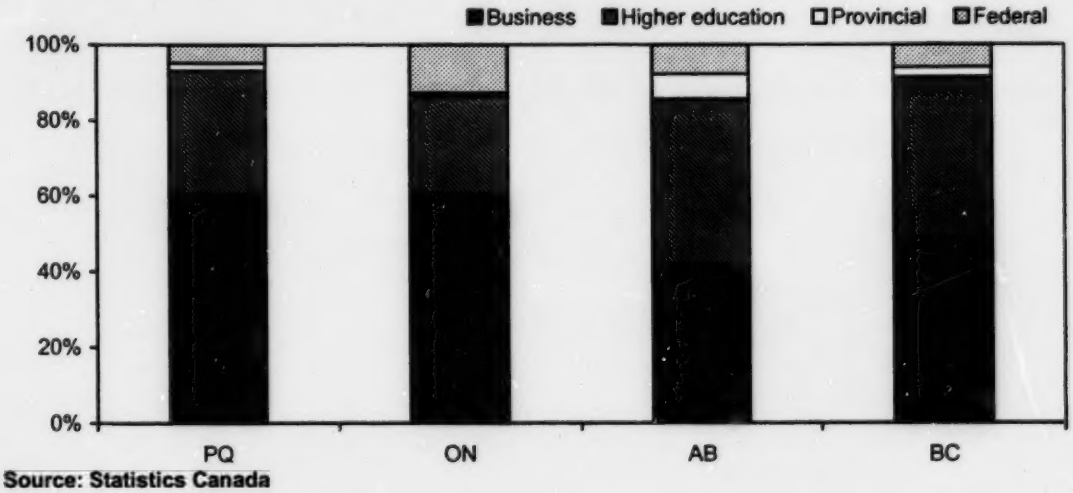
INDICATOR L-3: Total research workforce per 100,000 persons.



Source: Statistics Canada

Although business accounts for the largest proportion of research workforce in each high technology province, the proportions range from 40% of personnel in Alberta to 60% in Ontario and Quebec in 1998. Ontario has the largest portion of federal research personnel due to the concentration of federal agencies in the National Capital Region (Ottawa). Alberta's provincial government researcher workforce is more than double the Canadian average. BC's research workforces were all below the Canadian average in 1998.

FIGURE 2: Structure of the research workforce by sector in 1998.



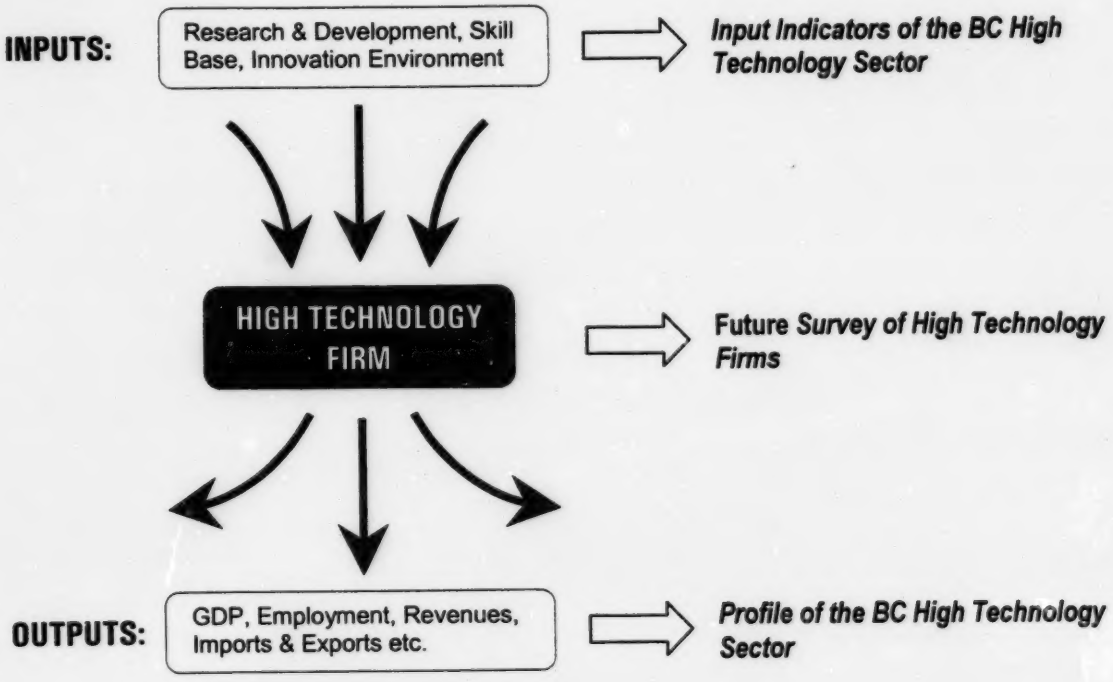
Source: Statistics Canada

APPENDIX I: BC STATS' SECTOR MODEL

In BC STATS' model of the high technology sector (see "Modeling the High Technology Sector," below), the **firm** is the centre of the system of high technology production. The firm receives inputs, in the form of labour, physical and financial capital, raw materials and parts, and knowledge. Knowledge may be embodied in labour (human capital) or other inputs, or it may come in the form of patents and copyrights, books and electronic information, etc. Through its internal operations, the firm then produces outputs. These outputs are products and services, and (in some views) also include employment and other benefits to society.

This firm-centred view underlies BC STATS' publication strategy for high technology sector information, as shown in the diagram below.

TABLE 7: BC STATS' products for monitoring the high technology sector.


INPUTS:
Research & Development, Skill Base, Innovation Environment
Input Indicators of the BC High Technology Sector
HIGH TECHNOLOGY FIRM
Future Survey of High Technology Firms
OUTPUTS:
GDP, Employment, Revenues, Imports & Exports etc.
Profile of the BC High Technology Sector

What is an Indicator?

The concept of indicators is well understood in the operation of machines. For instance, the dashboard of a car has many indicators. The speedometer measures the main output, which is forward motion. However, gauges such as oil pressure and water temperature assess how well the engine is working as a system. They predict the engine's future performance, and may suggest the need for specific adjustments.

When we want to predict the future, in terms of the economy, we need to examine the chain of events that leads to the production of specific outputs, and develop indicators for those steps in the chain judged to be most important. When we want to predict the future in terms of the high technology sector, we similarly need to develop a model of what drives growth in the sector, and then obtain indicators for each component of the model.

In selecting indicators, consideration must be given not only to their place in a growth model of the high technology sector, but also to their accuracy and availability. Indicators should meet other tests as well. In the annual (since 1997) *Index of the Massachusetts Innovation Economy,*[7] all potential indicators are subject to a set of five criteria. The indicators selected for inclusion in the report are:

- Derived from objective and reliable data sources,
- Statistically measurable on an ongoing basis,
- Bellwethers that reflect the fundamentals of economic vitality,
- Understood and accepted by the community, and are
- Measurements of conditions in which there is an active public interest.

These criteria help ensure that the indicators become relevant to politicians and citizens as well as to statisticians, and have been adopted for this report as well.

How is Research Progressing in this Field?

Detailed and generally accepted models for high technology sector growth do not exist at present. However, there has been loose agreement on some of the most important factors. One of the first of these factors to be explored was "research and development" spending. At the international level, the Organization for Economic Cooperation and Development (OECD), of which Canada is a member nation, took the lead with the *Frascati Manual: Proposed Standard*

[7]Collaborative Economics and Massachusetts Technology Collaborative, *Index of the Massachusetts Innovation Economy*, 1999. Available at http://www.mtpc.org/research/indica99.htm

Practice for Surveys of Research and Experimental Development (1963). Meeting in Frascati, Italy, national experts of research and development statistics recognized the need for consistent, comparable international measures. Their proposal became the international standard.

In 1995, the Science and Technology Agency of Japan published *Science and Technology Indicators: 1994 – A Systematic Analysis of Science & Technology Activities in Japan*, an update and revision of a similar document published in 1991. This comprehensive project was heavily focused on international comparisons between Japan and other nations, on the one hand comparing ratios of science and technology expenditures to Gross National Product for several leading science and technology countries, while on the other comparing the number of museums in Japan to the number in other countries. The critical focus, however, was on comparisons of R&D expenditures and effort between nations.

In 1997, the Massachusetts Technology Collaborative, a joint effort of government, industry and academia, produced the first of its annual publications, *Index of the Massachusetts Innovation Economy* that presented 33 indicators (a mixture of both input and output indicators). However, these indicators are focused more on the intangible *innovation* economy which is "based on a dynamic conceptual framework that links resources to economic results through an innovation process." The index annually tracks the benchmark performance (indicators) of nine key industry clusters for six leading technology states throughout the US. The 2000 version of the *Index* covers 30 separate indicators.

A similar effort has been produced by the Progressive Policy Institute (PPI) in the United States, which is responsible for the " New Economy Index." PPI offers thirty-nine indicators at the national level, and seventeen for each of fifty states.[8]

In 1998 Statistics Canada published *Science and Technology Activities and Impacts: A framework for a statistical information system* as well as *A Five-Year Strategic Plan for the Development of an Information System for Science and Technology*. These documents did not themselves contain any indicators but rather proposed a framework and strategy for the collection of science and technology indicators. However, Statistics Canada also stated "There is little underlying theory of how science and technology develops and interacts with other activities in different institutions. There are some procedural measures, many unsubstantiated beliefs and myths, and there are major information gaps." These caveats from Statistics Canada show that there is still much work to be done in this field.

[8]Available at http://www.neweconomyindex.org/states/

APPENDIX I

In 1998, BC STATS, ISTA, and the Science Council of BC began a collaboration to devise a model of the BC high technology sector, with an associated set of indicators. This resulted in two working papers. The first reviewed definitions of the high technology sector and models of the innovation economy in other jurisdictions, while the second proposed a model for use in BC, together with a large number of potential indicators for that model.[9] Subsequently BC STATS has simplified the model and prepared a corresponding shorter list of indicators. The simplified model and indicators form the basis for this publication.

Modeling the High Technology Sector

The traditional model of economic production focuses on land, labour and capital, which are the "factors of production" or inputs into the production process. These factors are transformed by firms, other organizations, or individuals into valued goods and services. GDP is the main measure of that value and is the most common statistic used to describe the production of economic sectors. This traditional model can be thought of as an input/output view of the economy. The inputs are obtained from a variety of sources and enter a production process, resulting in outputs.[10]

The advent of the "information economy" has added a new dimension to traditional economic production, and some efforts to describe it seem quite new as well. However, the input/output view can readily be adapted to the information economy. In the model above the firm is at the centre of the productive system. As in the traditional model, the firm receives inputs, however knowledge, technology, and information are distinguished as a unique category. This can include patents and copyrights, software, information on production methods, etc. In addition, it is recognized that the other factors, labour, capital, and materials each have critical and increasing quantities of knowledge embodied in them.

The diagram then looks beyond the production inputs, to analyze their sources (the top row of boxes). For example, skilled labour may come from training courses in educational institutions, from in-house training, or from other provinces or countries. The sources for the inputs have been categorized as four "sectors." Within each sector, particular areas that bear on the production inputs are identified. These areas are the ones for which indicator variables have

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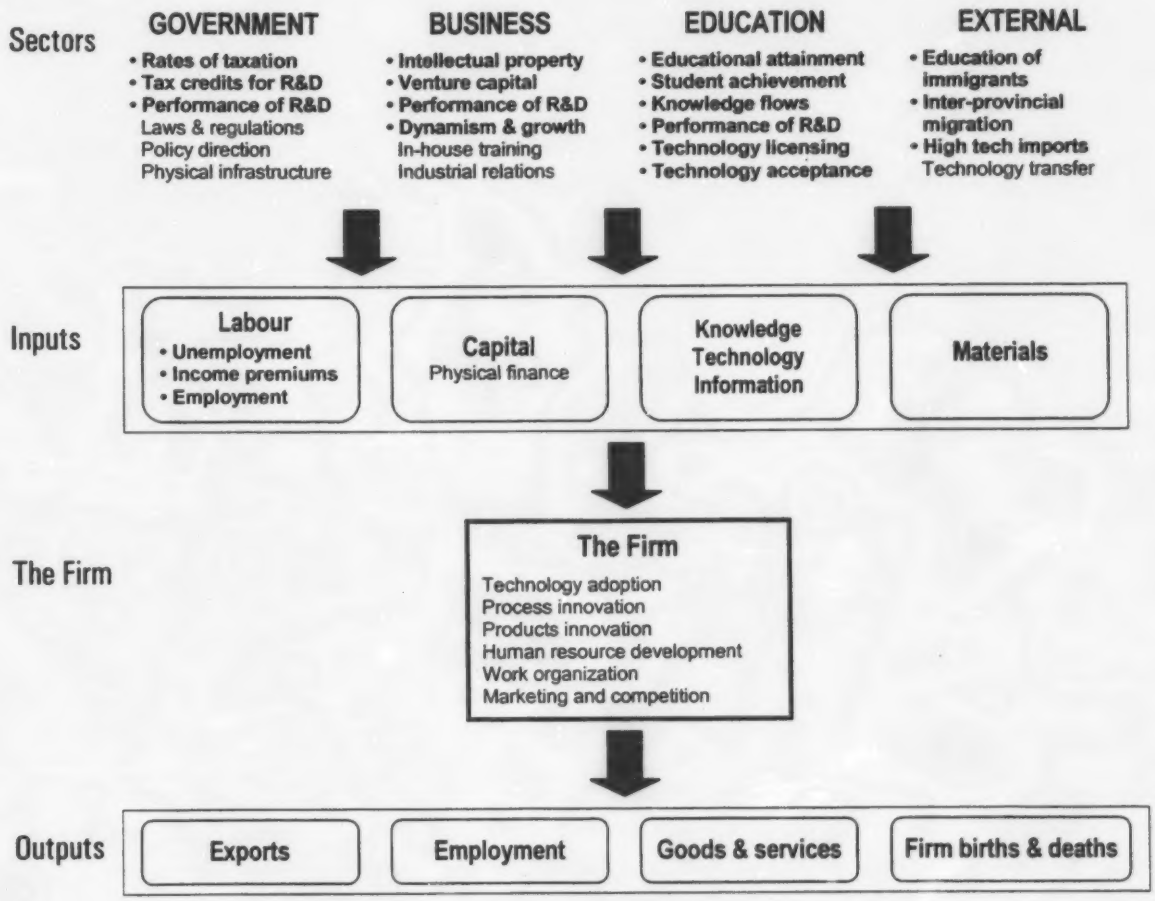
[9] Koebberling, Uschi and Veneranda Dettmers, "A Model of the BC High Technology Sector: Description of Factors and Linkages Affecting the Growth of the High Technology Sector in the Context of an Innovation Economy," Science Council of BC, April 1999.

[10] This is also referred to as the neoclassical model. See Lipsey, Richard G. and Kenneth Carlaw, "A Structuralist Assessment of Technology Policies—Taking Schumpeter Seriously on Policy," Working Paper # 25, Industry Canada, Research Publications Program, October 1998. Available at http://www.strategis.ic.gc.ca

been sought out. The areas listed in bold, and ticked off, are the ones for which data is available and has been collected by BC STATS.

TABLE 8: Model of the high technology sector.



While the indicator variables have normally been sought out at the level of the source sectors, certain labour indicators, such as the unemployment rate, are not attributable to a single source sector. Such indicators have been grouped in a separate "labour" section.

Once the inputs are obtained by the firm, they are transformed in a way that depends on the firm's many characteristics. Some of the characteristics of most importance for high technology firms are listed within the FIRM box in the diagram.[11]

[11]For an in-depth study of uses of knowledge within high technology firms, see Schuetze, Hans, "Innovation, Skills, and Learning: A Study of Knowledge and Human Resources Management in Small and Medium Sized Enterprises in British Columbia," Centre for Policy Studies in Education, University of British Columbia, March 1998.

Finally, the firm produces and sells goods and services, some of which are consumed locally, while the remainder are exported. This is depicted in the bottom row. It should be recognized that even with a simplified model such as the one set out here, it is possible to imagine a large number of interactions. That is, almost every box or element within the boxes could be joined by an arrow to every other box or element. In turn, a complete statistical system based on the model would track the flows of people, dollars, or information along each of the pathways (arrows). Such a comprehensive approach is neither practical, nor would it in the end necessarily lead to greater understanding and better policy. However, statistics are available on a significant number of the interactions, providing a strong database for future research.

APPENDIX II: DETAILED TABLES

Educational indicators

INDICATOR E-1: Percentage of the population aged 15 years and older with a high school diploma.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CANADA	62.1%	62.8%	64.2%	65.9%	66.2%	67.1%	68.0%	69.2%	69.8%	70.6%	71.8%
NFLD	51.6%	52.9%	54.2%	55.1%	55.2%	56.8%	57.8%	58.4%	59.7%	60.9%	62.4%
PEI	51.2%	52.2%	54.8%	57.9%	57.3%	59.1%	60.5%	60.8%	62.6%	62.8%	64.2%
NS	57.5%	58.0%	59.4%	61.3%	60.7%	62.0%	63.0%	64.8%	66.4%	67.0%	68.1%
NB	55.6%	56.2%	58.2%	60.2%	61.0%	62.3%	61.5%	64.0%	65.6%	65.7%	66.0%
PQ	56.6%	57.5%	59.0%	60.9%	60.6%	61.8%	63.0%	65.3%	65.6%	66.4%	67.3%
ON	64.2%	64.6%	66.0%	67.6%	68.4%	69.3%	69.8%	70.5%	71.1%	72.6%	73.9%
MB	58.1%	59.3%	60.6%	61.1%	62.0%	63.2%	64.7%	66.0%	66.3%	66.5%	68.3%
SK	58.0%	58.1%	59.5%	61.4%	61.7%	62.7%	62.9%	64.2%	66.1%	66.0%	67.6%
AB	67.9%	68.7%	69.6%	71.5%	71.5%	71.7%	72.7%	73.7%	74.8%	74.3%	75.1%
BC	70.5%	71.8%	72.3%	73.6%	73.9%	74.3%	75.4%	75.2%	75.7%	75.9%	77.3%

INDICATOR E-2: Percentage of the population aged 15 years and older with post-secondary credentials.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CANADA	25.0%	25.5%	26.3%	27.5%	29.2%	30.0%	30.6%	32.2%	32.8%	33.5%	33.8%
NFLD	21.6%	22.6%	23.6%	24.1%	25.3%	26.8%	26.8%	28.2%	29.5%	30.8%	31.6%
PEI	20.6%	20.8%	22.6%	24.6%	26.6%	28.6%	28.4%	29.3%	30.1%	30.9%	31.1%
NS	27.3%	27.8%	28.4%	29.2%	30.5%	31.2%	32.2%	33.9%	34.7%	35.2%	35.6%
NB	22.0%	21.6%	22.8%	24.5%	26.4%	27.1%	26.8%	28.1%	29.0%	30.8%	31.0%
PQ	24.8%	25.5%	27.0%	28.2%	29.5%	31.1%	31.8%	33.7%	34.3%	34.7%	35.1%
ON	25.6%	26.0%	26.8%	27.6%	29.5%	29.7%	30.5%	32.4%	32.7%	33.7%	34.3%
MB	20.9%	22.0%	22.1%	22.8%	23.4%	25.3%	26.0%	27.2%	28.5%	29.2%	29.1%
SK	21.0%	20.8%	21.9%	22.7%	24.1%	24.9%	24.4%	25.5%	27.0%	27.2%	27.9%
AB	26.1%	26.6%	27.6%	29.4%	30.2%	30.7%	31.0%	32.3%	33.5%	33.4%	33.4%
BC	26.4%	26.1%	26.1%	28.4%	31.0%	31.4%	32.2%	33.1%	33.5%	34.0%	34.1%

INDICATOR E-3: Canada-wide rank of 16-year old achievement in science.

	1996	1999
NFLD	4	5
PEI	6	2
NS	10	6
NB	9	9
PQ	8	4
ON	6	10
MB	2	3
SK	3	8
AB	1	1
BC	5	6

INDICATOR E-4: Engineering bachelor degrees awarded per 100,000 persons aged 15 years and older.

	1990	1991	1992	1993	1994	1995	1996	1997
CANADA	33.3	33.1	33.8	33.7	35.0	36.2	36.7	34.8
NFLD	18.4	25.7	23.2	26.3	27.0	30.6	28.1	26.7
PEI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	28.0	23.3	25.0	32.1	29.2	35.7	29.7	39.0
NB	36.2	34.2	33.8	38.8	34.5	40.7	38.7	40.7
PQ	43.5	45.3	44.4	43.9	45.1	45.3	45.1	41.3
ON	34.9	34.0	36.3	35.5	37.5	39.1	41.0	38.3
MB	21.5	20.1	24.2	24.4	25.3	26.3	28.3	26.2
SK	27.4	31.4	28.8	29.6	29.6	31.3	34.7	33.8
AB	35.8	32.9	30.8	28.1	32.9	31.3	34.4	31.9
BC	14.4	14.0	15.7	17.4	17.2	19.1	16.8	17.1

INDICATOR E-5: Computer Science bachelor degrees per 100,000 persons aged 15 years and older.

	1990	1991	1992	1993	1994	1995	1996	1997
CANADA	10.3	10.4	10.5	10.7	11.4	13.0	13.0	12.9
NFLD	4.3	5.6	5.8	5.6	4.2	4.7	9.4	10.8
PEI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	12.8	10.7	13.3	13.6	13.3	16.3	20.1	17.8
NB	12.8	13.7	11.4	12.5	16.9	15.7	17.3	16.3
PQ	12.4	12.0	12.0	12.5	11.5	12.8	13.1	13.8
ON	10.0	10.1	10.8	10.3	11.5	13.2	13.3	13.6
MB	8.5	12.1	13.1	16.3	20.5	22.0	18.8	16.7
SK	13.5	15.7	14.3	16.4	17.6	18.2	18.3	14.3
AB	9.3	8.6	9.1	7.6	9.0	10.7	9.4	9.5
BC	7.7	7.2	6.3	7.6	8.5	10.8	9.7	9.1

INDICATOR E-6: Percentage of households with home computers.

	1997	1998	1999
CANADA	39.8%	45.0%	49.8%
NFLD	27.9%	34.4%	38.6%
PEI	28.4%	32.6%	39.6%
NS	33.5%	37.2%	42.1%
NB	31.1%	32.1%	37.4%
PQ	31.7%	38.4%	42.2%
ON	44.3%	48.9%	54.6%
MB	33.2%	40.9%	44.2%
SK	36.0%	37.3%	42.3%
AB	46.7%	50.7%	57.9%
BC	46.8%	51.8%	54.5%

INDICATOR E-7: Percentage of households using the internet.

	1997	1998	1999	2000
CANADA	29.0%	35.9%	41.8%	51.3%
NFLD	26.1%	28.8%	35.2%	45.5%
PEI	25.7%	35.4%	40.5%	51.1%
NS	31.8%	37.8%	41.1%	52.0%
NB	28.1%	31.0%	38.0%	45.2%
PQ	19.8%	26.2%	33.1%	43.6%
ON	32.9%	39.1%	44.5%	54.2%
MB	28.8%	33.3%	38.3%	49.8%
SK	26.4%	33.7%	39.9%	46.9%
AB	34.0%	45.1%	50.8%	58.8%
BC	33.0%	42.0%	48.1%	55.9%

Includes use from home, work, school, libraries and other locations.

Indicator E-8: Percentage of small businesses using the internet in 2000.

	Internet user	E-business
NFLD	53%	26%
PEI	70%	20%
NS	73%	26%
NB	65%	26%
PQ	59%	29%
ON	72%	41%
MB	67%	33%
SK	57%	22%
AB	72%	41%
BC	74%	44%

INDICATOR E-9: Gross income per technology license (in $,000 US).

INSTITUTION	1991	1992	1993	1994	1995	1996	1997	1998	1999
Queens	$11	$10	$20	$19	$21	$32	$19	$19	$27
U of Toronto	$13	$17	$37	$26	$29	$37	$53	$53	$21
U of Western Ontario	$2	$2	$1	$2	$2	$4	$16	$16	$16
U of Alberta	$12	$15	$14	$27	$22	$24	$41	$41	$20
U of BC	$23	$18	$25	$37	$46	$48	$59	$59	$55

INDICATOR E-10: Number of US patents issued to top two institutions (actual).

PROVINCE	1993	1994	1995	1996	1997	1998	1999
ON	21	12	22	16	12	9	18
AB	15	8	12	18	18	18	26
BC	23	18	18	29	20	24	55

INDICATOR E-11: Ratio of higher education performance of R&D to GDP.

	1990	1991	1992	1993	1994	1995	1996	1997	1998
CANADA	0.46%	0.50%	0.52%	0.52%	0.49%	0.48%	0.46%	0.47%	0.46%
NFLD	0.60%	0.59%	0.63%	0.62%	0.57%	0.54%	0.54%	0.58%	0.55%
PEI	0.18%	0.18%	0.17%	0.16%	0.16%	0.15%	0.14%	0.18%	0.25%
NS	0.70%	0.73%	0.68%	0.66%	0.61%	0.61%	0.61%	0.62%	0.63%
NB	0.35%	0.37%	0.38%	0.37%	0.36%	0.35%	0.35%	0.35%	0.36%
PQ	0.58%	0.68%	0.75%	0.73%	0.68%	0.64%	0.62%	0.64%	0.60%
ON	0.44%	0.46%	0.48%	0.51%	0.49%	0.47%	0.47%	0.47%	0.46%
MB	0.49%	0.51%	0.52%	0.49%	0.49%	0.47%	0.44%	0.41%	0.43%
SK	0.44%	0.47%	0.49%	0.46%	0.44%	0.43%	0.39%	0.41%	0.42%
AB	0.38%	0.40%	0.39%	0.38%	0.36%	0.37%	0.34%	0.35%	0.37%
BC	0.35%	0.38%	0.39%	0.35%	0.34%	0.35%	0.33%	0.32%	0.32%

APPENDIX II

Business Indicators

INDICATOR B-1: Patents awarded per 10,000 population.

	1998	1999
CANADA	0.27	0.44
NFLD	0.07	0.13
PEI	0.07	0.15
NS	0.04	0.12
NB	0.19	0.23
PQ	0.28	0.41
ON	0.33	0.59
MB	0.18	0.28
SK	0.32	0.32
AB	0.31	0.55
BC	0.19	0.26

INDICATOR B-2: Patent applications per 10,000 population.

	1998	1999
CANADA	1.48	1.45
NFLD	0.42	0.30
PEI	0.51	0.58
NS	0.36	0.61
NB	0.58	0.70
PQ	1.74	1.96
ON	1.62	1.73
MB	1.10	0.90
SK	0.89	1.36
AB	2.03	1.97
BC	1.09	1.20

INDICATORS B-3, B-4 and B-5: Number of establishments, entries, exists, and gazelles in the high technology sector.

	1993	1994	1995	1996	1997	1998	1999	2000
Establishments	4,437	4,701	5,106	5,720	6,332	6,843	7,349	7,786
Entries		952	1,181	1,382	1,880	1,880	1,611	1,628
Exits		(688)	(776)	(768)	(1,268)	(1,369)	(1,105)	(1,191)
Gazelles		73	68	73	100	102	157	231

INDICATOR B-6: Canadian venture capital investment by investee province (in $ millions CDN).

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CANADA	$270	$285	$369	$420	$617	$1,045	$1,679	$1,495	$2,491	$5,082
ATLANTIC	$0	$0	$3	$2	$7	$27	$22	$34	$61	$75
PQ	$98	$105	$197	$172	$258	$325	$546	$630	$727	$1,335
ON	$64	$120	$101	$125	$218	$467	$704	$531	$1,257	$2,970
MB	$16	$3	$6	$21	$15	$39	$88	$26	$46	$32
SK	$2	$11	$16	$45	$37	$42	$51	$34	$21	$13
AB	$47	$19	$31	$10	$18	$42	$61	$93	$129	$211
BC	$43	$27	$15	$45	$64	$103	$207	$147	$250	$446

INDICATOR B-7: Proportional share of Canadian venture capital investment.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
ATLANTIC	0.0%	0.0%	0.8%	0.5%	1.1%	2.6%	1.3%	2.3%	2.4%	1.5%
PQ	36.3%	36.8%	53.4%	41.0%	41.8%	31.1%	32.5%	42.1%	29.2%	26.3%
ON	23.7%	42.1%	27.4%	29.8%	35.3%	44.7%	41.9%	35.5%	50.5%	58.4%
MB	5.9%	1.1%	1.6%	5.0%	2.4%	3.7%	5.2%	1.7%	1.8%	0.6%
SK	0.7%	3.9%	4.3%	10.7%	6.0%	4.0%	3.0%	2.3%	0.8%	0.3%
AB	17.4%	6.7%	8.4%	2.4%	2.9%	4.0%	3.6%	6.2%	5.2%	4.2%
BC	15.9%	9.5%	4.1%	10.7%	10.4%	9.9%	12.3%	9.8%	10.0%	8.8%

INDICATOR B-8: Canadian venture capital investment per capita.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CANADA	$10.31	$10.89	$13.95	$15.89	$22.87	$35.47	$60.93	$54.93	$89.49	$206.17
ATLANTIC	$0.00	$0.00	$1.26	$0.84	$2.94	$11.34	$9.24	$14.34	$25.72	$31.57
PQ	$13.87	$14.76	$27.49	$23.86	$35.63	$44.68	$74.77	$86.02	$98.92	$181.08
ON	$6.14	$11.35	$9.45	$11.54	$19.88	$42.07	$62.58	$46.64	$109.14	$254.51
MB	$14.42	$2.70	$5.37	$18.69	$13.28	$34.38	$77.42	$22.85	$40.26	$27.88
SK	$1.99	$10.96	$15.89	$44.57	$36.48	$41.20	$49.90	$33.17	$20.47	$12.70
AB	$18.13	$7.21	$11.61	$3.70	$6.57	$15.10	$21.50	$31.99	$43.59	$70.40
BC	$12.75	$7.78	$4.20	$12.22	$16.91	$26.53	$52.28	$36.77	$62.06	$109.75

INDICATOR B-9: Ratio of business performance of R&D to GDP.

	1990	1991	1992	1993	1994	1995	1996	1997	1998
CANADA	0.76%	0.78%	0.82%	0.89%	0.99%	0.99%	0.97%	0.99%	1.01%
NFLD	0.11%	0.10%	0.12%	0.10%	0.12%	0.10%	0.15%	0.12%	0.11%
PEI	0.14%	0.09%	0.09%	0.08%	0.08%	0.11%	0.11%	0.11%	0.07%
NS	0.18%	0.15%	0.18%	0.24%	0.33%	0.33%	0.28%	0.26%	0.24%
NB	0.34%	0.22%	0.21%	0.28%	0.33%	0.32%	0.36%	0.20%	0.17%
PQ	0.92%	0.98%	1.04%	1.11%	1.21%	1.29%	1.33%	1.33%	1.33%
ON	1.01%	1.05%	1.10%	1.20%	1.33%	1.33%	1.28%	1.35%	1.39%
MB	0.21%	0.27%	0.29%	0.37%	0.39%	0.36%	0.33%	0.31%	0.30%
SK	0.23%	0.26%	0.31%	0.26%	0.29%	0.28%	0.20%	0.29%	0.25%
AB	0.49%	0.48%	0.45%	0.49%	0.58%	0.54%	0.52%	0.50%	0.52%
BC	0.46%	0.43%	0.49%	0.50%	0.59%	0.57%	0.51%	0.51%	0.47%

Government Indicators

INDICATOR G-1: Index of all taxes paid by unattached individuals earning $80,000 per year.

	1992	1993	1994	1995	1996	1997	1998	1999	2000
NFLD	110.3	117.6	110.9	111.3	111.4	110.1	109.8	108.5	99.5
PEI	104.9	105.3	101.4	101.4	101.5	101.5	102.7	101.3	92.0
NS	106.6	107.3	104.1	102.8	102.9	102.4	103.6	99.4	95.1
NB	103.7	104.1	100.9	100.9	101.0	100.4	100.8	99.3	93.3
PQ	116.8	127.0	126.7	124.3	126.0	125.9	126.2	124.3	122.5
ON	105.0	113.8	111.8	111.4	111.5	106.5	104.2	103.2	92.1
MB	107.8	114.5	110.3	110.8	112.6	112.6	112.4	110.2	102.4
SK	106.1	110.2	105.4	105.4	105.2	105.2	103.2	104.8	93.7
AB	96.1	95.1	93.0	93.4	93.4	93.3	92.5	90.4	79.1
BC†	100.0	101.6	98.8	98.1	98.0	97.3	96.4	95.6	86.8

† Index: BC 1992 = 100

INDICATOR G-2: Small business tax rate.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002†
NFLD	10.0%	10.0%	10.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
PEI	10.0%	10.0%	10.0%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%
NS	10.0%	10.0%	10.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
NB	9.0%	9.0%	9.0%	9.0%	6.0%	7.0%	4.0%	7.0%	7.0%	6.0%	4.5%	4.0%	4.0%
PQ	3.4%	3.5%	3.8%	3.8%	5.8%	5.8%	5.8%	5.8%	5.9%	9.2%	9.0%	9.0%	9.0%
ON	10.0%	10.0%	10.0%	9.5%	9.5%	9.5%	9.5%	9.5%	9.5%	8.5%	7.0%	6.5%	6.0%
MB	10.0%	10.0%	10.0%	10.0%	10.0%	9.0%	9.0%	9.0%	9.0%	9.0%	7.0%	6.0%	5.0%
SK	10.0%	10.0%	10.0%	9.0%	9.5%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	6.0%	6.0%
AB	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	5.0%	4.0%
BC	9.0%	9.0%	10.0%	10.0%	10.0%	10.0%	9.0%	9.0%	9.0%	5.5%	4.5%	4.5%	4.5%

† 2002 rates are projected.

INDICATOR G-3: General corporate tax rate.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002[†]
NFLD	17.0%	17.0%	17.0%	16.0%	16.0%	16.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%	14.0%
PEI	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	16.0%	16.0%	16.0%	16.0%	16.0%
NS	15.0%	16.0%	16.0%	16.0%	16.0%	16.0%	16.0%	16.0%	16.0%	16.0%	16.0%	16.0%	16.0%
NB	16.0%	17.0%	17.0%	17.0%	17.0%	14.0%	17.0%	17.0%	17.0%	17.0%	17.0%	16.0%	16.0%
PQ	6.2%	6.3%	6.9%	6.9%	8.9%	8.9%	8.9%	8.9%	9.2%	9.2%	9.0%	9.0%	9.0%
ON	15.0%	15.0%	15.0%	15.5%	15.5%	15.5%	15.5%	15.5%	15.5%	15.5%	14.0%	14.0%	12.5%
MB	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	16.5%
SK	15.0%	15.0%	15.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%
AB	15.0%	15.5%	15.5%	15.5%	15.5%	15.5%	15.5%	15.5%	15.5%	15.5%	15.5%	13.5%	11.5%
BC	14.0%	15.0%	16.0%	16.5%	16.5%	16.5%	16.5%	16.5%	16.5%	16.5%	16.5%	16.5%	13.5%

[†] 2002 rates are projected.

INDICATOR G-4: Ratio of combined federal and provincial performance of R&D to GDP.

	1990	1991	1992	1993	1994	1995	1996	1997	1998
CANADA	0.29%	0.29%	0.29%	0.28%	0.26%	0.24%	0.24%	0.22%	0.22%
NFLD	0.40%	0.41%	0.41%	0.41%	0.37%	0.30%	0.29%	0.26%	0.27%
PEI	0.46%	0.44%	0.39%	0.45%	0.44%	0.34%	0.32%	0.33%	0.32%
NS	0.51%	0.49%	0.43%	0.44%	0.48%	0.43%	0.44%	0.38%	0.40%
NB	0.30%	0.29%	0.28%	0.24%	0.20%	0.19%	0.20%	0.20%	0.20%
PQ	0.20%	0.20%	0.21%	0.21%	0.20%	0.18%	0.17%	0.15%	0.16%
ON	0.37%	0.38%	0.38%	0.38%	0.35%	0.34%	0.35%	0.31%	0.30%
MB	0.40%	0.41%	0.34%	0.35%	0.32%	0.28%	0.26%	0.20%	0.16%
SK	0.29%	0.29%	0.31%	0.30%	0.24%	0.24%	0.20%	0.28%	0.21%
AB	0.20%	0.20%	0.20%	0.17%	0.16%	0.16%	0.15%	0.13%	0.14%
BC	0.16%	0.15%	0.13%	0.12%	0.13%	0.10%	0.09%	0.10%	0.10%

INDICATOR G-5: Ratio of total expenditures on R&D to GDP.

	1990	1991	1992	1993	1994	1995	1996	1997	1998
CANADA	1.51%	1.57%	1.63%	1.68%	1.74%	1.71%	1.67%	1.68%	1.69%
NFLD	1.11%	1.11%	1.15%	1.14%	1.05%	0.95%	0.98%	0.97%	0.93%
PEI	0.78%	0.71%	0.64%	0.69%	0.68%	0.60%	0.57%	0.62%	0.63%
NS	1.38%	1.36%	1.29%	1.34%	1.42%	1.38%	1.33%	1.26%	1.27%
NB	0.99%	0.88%	0.87%	0.89%	0.88%	0.87%	0.90%	0.74%	0.72%
PQ	1.70%	1.86%	2.00%	2.05%	2.09%	2.10%	2.13%	2.12%	2.09%
ON	1.83%	1.89%	1.96%	2.09%	2.17%	2.14%	2.09%	2.13%	2.15%
MB	1.10%	1.19%	1.15%	1.20%	1.20%	1.11%	1.03%	0.92%	0.89%
SK	0.96%	1.02%	1.11%	1.02%	0.97%	0.95%	0.80%	0.98%	0.88%
AB	1.07%	1.08%	1.04%	1.03%	1.10%	1.06%	1.01%	0.97%	1.03%
BC	0.97%	0.96%	1.01%	0.98%	1.06%	1.02%	0.93%	0.93%	0.88%

TABLE 9: Profile of the BC total expenditures on R&D (in $ millions CDN).

SECTOR	1990	1991	1992	1993	1994	1995	1996	1997	1998
Business Enterprise	$367	$348	$427	$471	$591	$603	$548	$575	$534
Higher Education and Private Non-Profit	$281	$309	$340	$330	$343	$365	$360	$367	$365
Federal Government	$95	$96	$86	$88	$103	$80	$77	$83	$85
Provincial Government and Research Institutions	$29	$29	$24	$27	$29	$22	$25	$28	$24

External Indicators

INDICATOR X-1: Percentage of immigrants aged 25 years and older with 16 or more years of education.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CANADA	21.2%	21.4%	20.4%	21.6%	24.8%	28.2%	32.7%	35.8%	36.8%	40.1%	42.3%
NFLD	42.4%	40.8%	41.3%	45.5%	46.8%	50.5%	47.9%	46.1%	46.1%	47.3%	51.0%
PEI	27.4%	35.4%	25.6%	33.0%	21.5%	33.7%	22.6%	40.9%	35.1%	28.4%	30.8%
NS	26.0%	26.5%	29.8%	31.6%	37.2%	42.8%	43.0%	42.8%	44.8%	41.4%	45.2%
NB	34.2%	34.0%	39.5%	37.4%	41.9%	42.2%	40.3%	42.8%	43.6%	44.8%	41.1%
PQ	26.4%	24.8%	23.7%	24.5%	27.7%	30.0%	30.2%	30.4%	34.6%	38.7%	40.3%
ON	20.0%	19.8%	19.0%	20.2%	23.9%	27.2%	33.3%	37.1%	37.7%	41.7%	44.2%
MB	19.0%	18.5%	19.4%	20.1%	26.5%	30.7%	30.4%	34.3%	31.6%	31.5%	29.8%
SK	23.4%	31.9%	25.9%	28.2%	32.0%	38.8%	37.7%	36.7%	38.6%	39.9%	39.2%
AB	20.5%	20.4%	19.0%	19.7%	22.2%	28.2%	33.0%	34.7%	36.7%	38.4%	39.5%
BC	19.8%	21.2%	20.4%	22.5%	24.7%	27.8%	32.1%	35.6%	36.1%	38.1%	39.9%

INDICATOR X-2: Median years of schooling of immigrants aged 25 years and older.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CANADA	11.3	11.3	11.3	11.3	11.4	12.4	13.3	13.4	13.5	14.3	14.3
NFLD	14.3	13.5	13.5	14.4	14.4	15.3	14.4	14.4	14.4	14.4	15.3
PEI	11.4	12.4	11.4	12.5	11.3	13.3	11.0	13.4	12.4	12.4	12.4
NS	11.5	11.4	11.4	12.4	13.4	14.4	14.4	14.3	14.4	14.4	14.3
NB	12.5	12.4	13.4	13.4	13.5	13.5	13.4	14.4	14.4	14.3	14.4
PQ	11.4	11.4	11.4	11.4	11.4	12.4	12.4	12.5	13.4	13.4	13.5
ON	11.3	11.3	11.3	11.3	11.4	11.5	13.4	13.5	14.3	14.3	14.4
MB	11.3	11.3	11.3	11.3	11.4	12.5	13.3	13.4	13.3	13.3	13.3
SK	11.3	12.4	11.3	11.4	11.5	13.4	13.4	13.4	13.5	13.5	13.4
AB	11.3	11.3	11.3	11.3	11.3	12.4	13.3	13.4	13.5	14.3	14.3
BC	11.3	11.3	11.3	11.3	11.4	11.5	13.3	13.4	13.4	14.3	14.3

INDICATOR X-3: Net inter-provincial migration.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
NFLD	(1,137)	(1,084)	(2,563)	(3,397)	(6,204)	(6,566)	(7,945)	(8,522)	(7,971)	(2,865)	(3,534)
PEI	(273)	(415)	232	532	694	368	401	(241)	(15)	669	255
NS	(106)	1,039	355	(1,143)	(2,694)	(1,972)	(1,064)	(2,074)	(1,571)	1,440	(208)
NB	1,014	(79)	(1,087)	(492)	(505)	(931)	(910)	(1,812)	(2,935)	80	15
PQ	(9,567)	(13,047)	(9,785)	(7,426)	(10,252)	(10,248)	(15,358)	(17,559)	(14,512)	(13,553)	(14,724)
ON	(15,117)	(9,978)	(13,530)	(12,771)	(4,527)	(1,764)	(1,706)	6,823	11,466	16,624	21,940
MB	(8,613)	(7,581)	(6,417)	(5,206)	(4,010)	(3,344)	(3,738)	(6,717)	(3,097)	(1,435)	(2,410)
SK	(15,928)	(9,499)	(7,727)	(4,543)	(3,958)	(3,190)	(1,871)	(2,669)	(1,786)	(6,230)	(8,426)
AB	11,055	5,511	1,030	(2,355)	(2,684)	4,251	15,069	32,459	40,125	13,985	21,951
BC	38,704	34,572	39,578	37,595	34,449	23,414	17,798	1,980	(17,521)	(8,129)	(14,123)

INDICATOR X-4: Value of high technology imports to BC by commodity type (in $ millions CDN).

COMMODITY	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Computers & Telecommunications	$643.3	$705.0	$836.2	$995.1	$1,195.7	$1,374.5	$593.9	$656.4	$705.5	$811.3	$1,100.6
Computer Integrated Manufacturing	$145.9	$154.0	$147.1	$206.5	$260.7	$307.7	$286.9	$392.2	$388.7	$403.3	$450.1
Aerospace	$270.5	$317.9	$347.5	$233.5	$234.7	$334.5	$423.3	$616.0	$669.4	$783.7	$807.8
Life Sciences	$251.0	$256.2	$283.8	$331.6	$398.3	$476.2	$472.7	$509.7	$572.9	$690.2	$690.9
Other	$195.9	$194.2	$225.1	$253.7	$348.4	$410.6	$235.7	$253.5	$298.4	$366.2	$490.0
TOTAL	$1,506.6	$1,627.3	$1,839.7	$2,020.4	$2,437.8	$2,903.5	$2,012.5	$2,427.8	$2,634.9	$3,054.7	$3,539.4

Labour Indicators

INDICATOR L-1: Unemployment rate for natural and applied science occupations.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CANADA	4.1%	5.1%	5.8%	5.9%	4.8%	4.3%	4.2%	3.5%	3.4%	3.4%	2.9%
NFLD	7.9%	7.5%	9.3%	7.9%	7.1%	8.1%	7.1%	6.5%	8.7%	9.1%	7.9%
PEI	14.3%	16.7%	20.8%	13.3%	20.8%	20.8%	13.3%	15.4%	13.3%	9.4%	6.9%
NS	5.3%	7.4%	7.1%	6.1%	7.4%	5.1%	5.7%	6.5%	4.9%	4.0%	5.1%
NB	5.5%	4.4%	6.8%	7.9%	6.8%	5.5%	5.1%	5.9%	6.3%	4.6%	5.7%
PQ	6.0%	5.8%	6.4%	7.5%	5.8%	5.7%	5.4%	4.6%	4.3%	3.6%	3.1%
ON	2.6%	4.8%	5.3%	5.1%	4.0%	3.3%	3.4%	2.8%	2.6%	3.1%	2.7%
MB	2.5%	4.0%	4.9%	5.6%	5.1%	2.5%	2.9%	2.6%	3.0%	2.3%	3.2%
SK	3.7%	3.5%	6.3%	5.2%	5.7%	3.4%	4.3%	3.5%	0.0%	4.4%	4.6%
AB	3.9%	4.4%	6.4%	5.2%	4.2%	4.0%	4.0%	2.2%	2.2%	3.1%	2.7%
BC	5.1%	5.0%	4.9%	5.1%	4.2%	4.0%	4.0%	3.5%	4.4%	3.3%	2.3%

INDICATOR L-2: Ratio of unemployment rates: natural and applied science occupations to total labour force.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CANADA	50.6%	49.5%	51.8%	51.8%	46.2%	45.7%	43.8%	38.5%	41.0%	44.7%	42.6%
NFLD	46.7%	41.7%	46.0%	38.7%	35.1%	44.8%	36.8%	34.9%	48.3%	53.8%	47.3%
PEI	97.9%	100.0%	114.9%	75.6%	120.9%	138.7%	90.5%	100.0%	96.4%	65.3%	57.5%
NS	50.5%	61.2%	53.8%	42.7%	54.8%	42.1%	46.3%	53.7%	46.7%	41.7%	56.0%
NB	45.5%	34.4%	52.3%	63.2%	54.8%	49.1%	44.0%	46.5%	51.6%	45.1%	57.0%
PQ	57.7%	47.9%	50.4%	56.4%	47.2%	50.0%	45.4%	40.4%	41.7%	38.7%	36.9%
ON	41.9%	50.5%	49.5%	46.8%	41.7%	37.9%	37.8%	33.3%	36.1%	49.2%	47.4%
MB	34.2%	46.5%	53.3%	60.2%	59.3%	34.7%	40.3%	40.0%	54.5%	41.1%	65.3%
SK	52.9%	47.3%	79.7%	63.4%	83.8%	51.5%	65.2%	59.3%	0.0%	72.1%	88.5%
AB	57.4%	54.3%	68.1%	54.2%	48.3%	51.3%	58.0%	37.9%	39.3%	54.4%	54.0%
BC	59.3%	49.5%	48.0%	52.6%	46.7%	47.6%	46.0%	41.7%	50.0%	39.8%	31.9%

INDICATOR L-3: Research workforce per 100,000 population, 1995 and 1998.

	Federal FTE		Provincial FTE		Business FTE		Higher education FTE		Other FTE		Total FTE		FTE per 100,000	
	1995	1998	1995	1998	1995	1998	1995	1998	1995	1998	1995	1998	1995	1998
CANADA	15,220	13,680	3,030	2,830	72,070	76,480	42,360	44,160	1,920	2,390	134,600	139,540	460	463
NFLD	200	210	60	0	160	200	1,430	720	0	0	1,850	1,130	326	207
PEI	90	80	0	0	40	50	0	100	0	0	130	230	96	168
NS	670	660	130	0	610	640	2,280	760	20	20	3,710	2,080	400	222
NB	280	260	70	100	540	380	1,240	760	40	30	2,170	1,530	289	203
PQ	2,080	2,000	860	880	22,260	24,980	10,820	13,500	410	490	36,430	41,850	503	571
ON	8,900	8,140	1,040	580	36,350	38,770	15,510	16,420	1,020	1,220	62,820	65,130	573	572
MB	950	440	50	60	1,120	980	2,020	1,480	200	250	4,340	3,210	384	282
SK	490	450	160	260	750	730	1,700	1,300	0	0	3,100	2,740	306	267
AB	870	750	450	650	3,820	4,060	3,490	4,240	180	350	8,810	10,050	322	346
BC	690	690	210	300	6,420	5,690	3,870	4,880	50	30	11,240	11,590	297	290

FTE: full time equivalent position

TABLE 10: Structure of the research workforce by sector in 1998.

	Federal	Provincial	Business	Higher education	TOTAL FTE
PQ	4.8%	2.1%	60.4%	32.6%	41,360
ON	12.7%	0.9%	60.7%	25.7%	63,910
AB	7.7%	6.7%	41.9%	43.7%	9,700
BC	6.0%	2.6%	49.2%	42.2%	11,560

FTE: full time equivalent position

Reference Tables

REFERENCE TABLE 1: Total population, 1990 to 2000.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CANADA†	27,614,174	27,941,019	28,283,895	28,608,974	28,940,777	29,256,392	29,572,384	29,887,239	30,148,818	30,394,234	30,649,649
NFLD	578,064	579,525	580,162	580,195	574,828	567,954	560,584	554,076	545,362	540,775	538,823
PEI	130,544	130,312	130,878	132,343	133,691	134,788	136,188	136,852	136,901	137,639	138,928
NS	909,693	915,068	919,350	923,704	926,322	927,710	931,235	934,538	936,110	939,222	940,996
NB	740,128	745,546	748,463	749,530	750,942	751,782	752,995	754,237	753,421	754,348	756,598
PQ	7,004,436	7,064,735	7,112,810	7,165,199	7,207,302	7,241,429	7,274,019	7,302,553	7,323,494	7,349,103	7,372,448
ON	10,299,571	10,427,621	10,570,475	10,690,447	10,827,501	10,964,925	11,100,876	11,249,490	11,386,133	11,517,304	11,669,344
MB	1,105,608	1,109,594	1,113,102	1,118,356	1,123,852	1,129,771	1,134,346	1,136,584	1,137,943	1,142,562	1,147,880
SK	1,007,115	1,002,668	1,003,987	1,006,949	1,009,685	1,014,172	1,019,459	1,022,020	1,024,908	1,025,720	1,023,636
AB	2,547,636	2,592,551	2,634,361	2,670,726	2,704,904	2,739,853	2,780,639	2,837,191	2,907,042	2,959,429	2,997,236
BC	3,291,379	3,373,399	3,470,307	3,571,525	3,681,750	3,784,008	3,882,043	3,959,698	3,997,504	4,028,132	4,063,760

† Canada is the sum of the 10 provinces.

REFERENCE TABLE 2: Population aged 15 years and older, 1990 to 2000.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CANADA†	21,217,000	21,540,600	21,867,300	22,179,700	22,440,000	22,726,500	23,030,700	23,359,300	23,671,100	23,969,000	24,284,900
NFLD	439,900	444,300	447,400	449,500	448,900	447,000	444,600	442,600	439,400	438,400	439,900
PEI	98,100	98,600	99,600	101,000	102,400	103,600	104,800	105,900	106,700	107,900	109,500
NS	697,000	703,500	708,300	713,000	716,300	719,800	724,700	730,200	734,900	740,800	747,700
NB	569,100	575,600	580,200	583,200	585,400	587,800	591,000	594,300	596,300	599,500	603,500
PQ	5,457,400	5,518,900	5,577,200	5,631,500	5,675,200	5,720,200	5,764,300	5,807,300	5,849,700	5,893,300	5,935,900
ON	7,961,100	8,094,200	8,229,200	8,353,200	8,448,900	8,563,000	8,681,000	8,821,800	8,966,600	9,111,100	9,274,400
MB	824,200	827,500	829,900	832,900	834,400	836,800	840,400	843,500	846,400	852,000	858,500
SK	733,800	731,600	733,300	736,300	739,100	743,500	749,400	753,900	759,200	762,800	763,700
AB	1,890,100	1,928,900	1,964,100	1,996,300	2,022,300	2,053,600	2,093,400	2,147,400	2,213,200	2,270,400	2,315,100
BC	2,546,300	2,617,600	2,698,000	2,782,700	2,867,100	2,951,200	3,036,900	3,112,300	3,158,700	3,192,900	3,236,600

† Canada is the sum of the 10 provinces.

REFERENCE TABLE 3: Number of households, 1990 to 1997.

	1990	1991	1992	1993	1994	1995	1996	1997
CANADA†	9,624,000	9,875,000	10,056,000	10,247,000	10,388,000	11,243,000	11,409,000	11,578,000
NFLD	173,000	177,000	177,000	182,000	183,000	194,000	191,000	199,000
PEI	45,000	47,000	46,000	47,000	48,000	50,000	49,000	51,000
NS	318,000	326,000	329,000	336,000	332,000	357,000	357,000	364,000
NB	247,000	251,000	256,000	256,000	255,000	286,000	285,000	285,000
PQ	2,533,000	2,618,000	2,656,000	2,688,000	2,720,000	2,937,000	2,995,000	3,062,000
ON	3,479,000	3,585,000	3,647,000	3,765,000	3,820,000	4,143,000	4,193,000	4,227,000
MB	388,000	389,000	396,000	387,000	397,000	419,000	424,000	429,000
SK	358,000	359,000	359,000	361,000	361,000	385,000	382,000	392,000
AB	869,000	898,000	912,000	923,000	928,000	1,009,000	1,036,000	1,042,000
BC	1,214,000	1,225,000	1,278,000	1,302,000	1,344,000	1,463,000	1,497,000	1,527,000

† Canada is the sum of the 10 provinces.

REFERENCE TABLE 4: Population of immigrants aged 25 years or older, 1990 to 2000.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CANADA†	133,412	151,316	164,416	159,947	140,079	132,527	140,985	134,993	108,890	121,103	144,926
NFLD	377	444	545	516	370	374	405	280	254	260	259
PEI	106	96	90	97	93	101	84	93	77	88	104
NS	539	438	504	453	379	407	454	402	475	963	924
NB	976	963	1,364	1,670	1,777	1,888	1,748	1,538	1,086	422	470
PQ	23,930	33,080	30,218	26,409	15,821	15,982	17,934	16,517	15,782	18,042	20,449
ON	71,452	78,669	90,997	84,963	74,409	72,486	74,934	73,863	58,163	66,449	85,375
MB	4,062	3,575	3,188	2,933	2,542	2,280	2,443	2,276	1,757	2,157	2,525
SK	1,398	1,535	1,529	1,499	1,375	1,246	1,133	1,075	988	1,065	1,086
AB	12,100	10,888	11,495	11,772	11,409	9,018	8,722	8,255	7,063	7,827	9,028
BC	18,472	21,628	24,486	29,635	31,904	28,745	33,128	30,694	23,245	23,830	24,706

† Canada is the sum of the 10 provinces.

REFERENCE TABLE 5: Unemployment rate for all occupations, 1990 to 2000.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CANADA	8.1%	10.3%	11.2%	11.4%	10.4%	9.4%	9.6%	9.1%	8.3%	7.6%	6.8%
NFLD	16.9%	18.0%	20.2%	20.4%	20.2%	18.1%	19.3%	18.6%	18.0%	16.9%	16.7%
PEI	14.6%	16.7%	18.1%	17.6%	17.2%	15.0%	14.7%	15.4%	13.8%	14.4%	12.0%
NS	10.5%	12.1%	13.2%	14.3%	13.5%	12.1%	12.3%	12.1%	10.5%	9.6%	9.1%
NB	12.1%	12.8%	13.0%	12.5%	12.4%	11.2%	11.6%	12.7%	12.2%	10.2%	10.0%
PQ	10.4%	12.1%	12.7%	13.3%	12.3%	11.4%	11.9%	11.4%	10.3%	9.3%	8.4%
ON	6.2%	9.5%	10.7%	10.9%	9.6%	8.7%	9.0%	8.4%	7.2%	6.3%	5.7%
MB	7.3%	8.6%	9.2%	9.3%	8.6%	7.2%	7.2%	6.5%	5.5%	5.6%	4.9%
SK	7.0%	7.4%	7.9%	8.2%	6.8%	6.6%	6.6%	5.9%	5.7%	6.1%	5.2%
AB	6.8%	8.1%	9.4%	9.6%	8.7%	7.8%	6.9%	5.8%	5.6%	5.7%	5.0%
BC	8.6%	10.1%	10.2%	9.7%	9.0%	8.4%	8.7%	8.4%	8.8%	8.3%	7.2%

REFERENCE TABLE 6: Gross domestic product in current dollars, 1990 to 1999.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
CANADA	$678,135	$683,239	$698,544	$724,960	$767,506	$807,088	$833,070	$877,921	$901,805	$957,911
NFLD	$9,218	$9,590	$9,550	$9,767	$10,257	$10,649	$10,403	$10,462	$11,232	$12,110
PEI	$2,177	$2,258	$2,331	$2,460	$2,515	$2,663	$2,814	$2,763	$2,851	$2,994
NS	$16,987	$17,644	$18,071	$18,308	$18,628	$19,263	$19,436	$20,195	$21,110	$22,407
NB	$13,437	$13,624	$14,029	$14,676	$15,261	$16,349	$16,580	$16,779	$17,457	$18,390
PQ	$153,299	$155,134	$158,357	$162,093	$170,148	$177,107	$180,199	$187,862	$193,695	$204,062
ON	$281,534	$281,570	$285,101	$291,733	$309,031	$327,246	$335,843	$357,300	$372,630	$396,775
MB	$24,103	$23,948	$24,420	$24,604	$25,871	$26,837	$28,319	$29,407	$29,966	$30,995
SK	$21,182	$21,176	$21,102	$23,028	$24,443	$26,334	$28,927	$29,046	$28,828	$30,143
AB	$73,077	$72,713	$74,748	$80,973	$87,637	$91,634	$98,197	$106,518	$106,174	$116,990
BC	$79,227	$81,766	$87,066	$93,822	$100,149	$105,319	$108,454	$113,596	$113,945	$118,783
TOTAL (10 prov.)	$674,241	$679,423	$694,775	$721,464	$763,940	$803,401	$829,172	$873,928	$897,888	$953,649

REFERENCE TABLE 7: Gross domestic product in constant 1992 dollars, 1990 to 1999.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
CANADA	$705,464	$692,247	*$698,544*	$714,583	$748,350	$769,082	$780,916	$815,013	$842,002	$880,254
NFLD	$9,723	$9,740	*$9,550*	$9,668	$10,126	$10,348	$9,914	$10,028	$10,625	$11,259
PEI	$2,264	$2,271	*$2,331*	$2,370	$2,492	$2,629	$2,714	$2,662	$2,742	$2,829
NS	$17,851	$17,803	*$18,071*	$18,193	$18,256	$18,578	$18,641	$19,242	$19,828	$20,865
NB	$13,631	$13,649	*$14,029*	$14,358	$14,643	$15,071	$15,266	$15,331	$15,941	$16,616
PQ	$160,838	$157,310	*$158,357*	$160,897	$167,241	$170,366	$172,707	$178,460	$183,835	$192,535
ON	$293,828	$282,865	*$285,101*	$288,164	$305,223	$316,581	$319,982	$335,508	$349,364	$370,722
MB	$24,917	$24,089	*$24,420*	$24,468	$25,298	$25,445	$26,205	$27,099	$27,892	$28,729
SK	$21,617	$22,090	*$21,102*	$22,654	$23,603	$23,934	$24,391	$25,661	$26,267	$26,547
AB	$72,321	$73,185	*$74,748*	$79,792	$84,622	$87,161	$89,284	$95,997	$99,504	$101,960
BC	$85,020	$85,289	*$87,066*	$90,543	$93,355	$95,370	$98,052	$101,277	$102,217	$104,323
TOTAL (10 prov.)	$702,010	$688,291	*$694,775*	$711,107	$744,859	$765,483	$777,156	$811,265	$838,215	$876,385

REFERENCE TABLE 8: Total employment for persons aged 15 and older.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CANADA	11,102,041	10,779,575	10,797,337	10,959,374	11,192,412	11,273,025	11,603,939	11,872,739	12,037,986	12,441,164
NFLD	162,391	158,507	158,432	163,837	165,468	164,867	161,062	164,946	166,839	170,799
PEI	42,143	42,143	43,361	43,503	46,438	49,313	47,561	49,053	51,417	53,179
NS	312,932	306,083	307,924	312,970	320,329	323,252	333,172	336,474	339,982	348,536
NB	261,125	253,574	255,665	257,392	262,402	266,230	269,999	273,495	277,763	283,265
PQ	2,785,176	2,666,557	2,656,218	2,672,643	2,715,081	2,716,227	2,789,063	2,845,321	2,877,705	2,965,149
ON	4,422,220	4,277,381	4,255,063	4,287,600	4,384,960	4,414,084	4,536,943	4,667,529	4,755,066	4,895,887
MB	406,459	405,329	403,580	413,716	426,551	431,040	435,597	446,948	463,778	485,062
SK	321,673	321,572	321,649	323,820	330,199	333,760	344,986	351,529	355,237	365,521
AB	1,083,393	1,048,158	1,042,868	1,084,830	1,092,574	1,111,492	1,185,880	1,225,554	1,235,274	1,300,765
BC	1,304,529	1,300,271	1,352,577	1,399,063	1,448,410	1,462,760	1,499,676	1,511,890	1,514,925	1,573,001